THE PAPER INDUSTRY and PAPER WORLD

AN EDUCATIONAL NEWS MAGAZINE—JUNE, 1943

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WINNING
THE WAR
TAKES MOUNTAINS
OF PAPER

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well served with—

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MACHINERY

AGITATORS
AND
MIXERS

CENTRI-CONE MIXERS
(Patented)

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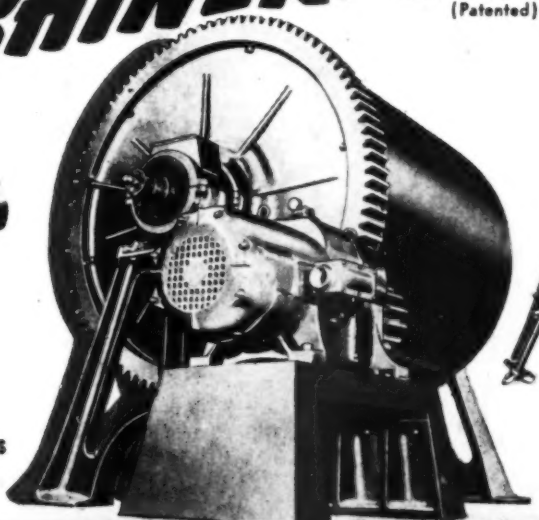

PEBBLE, BALL
AND TUBE MILLS

PORTABLE
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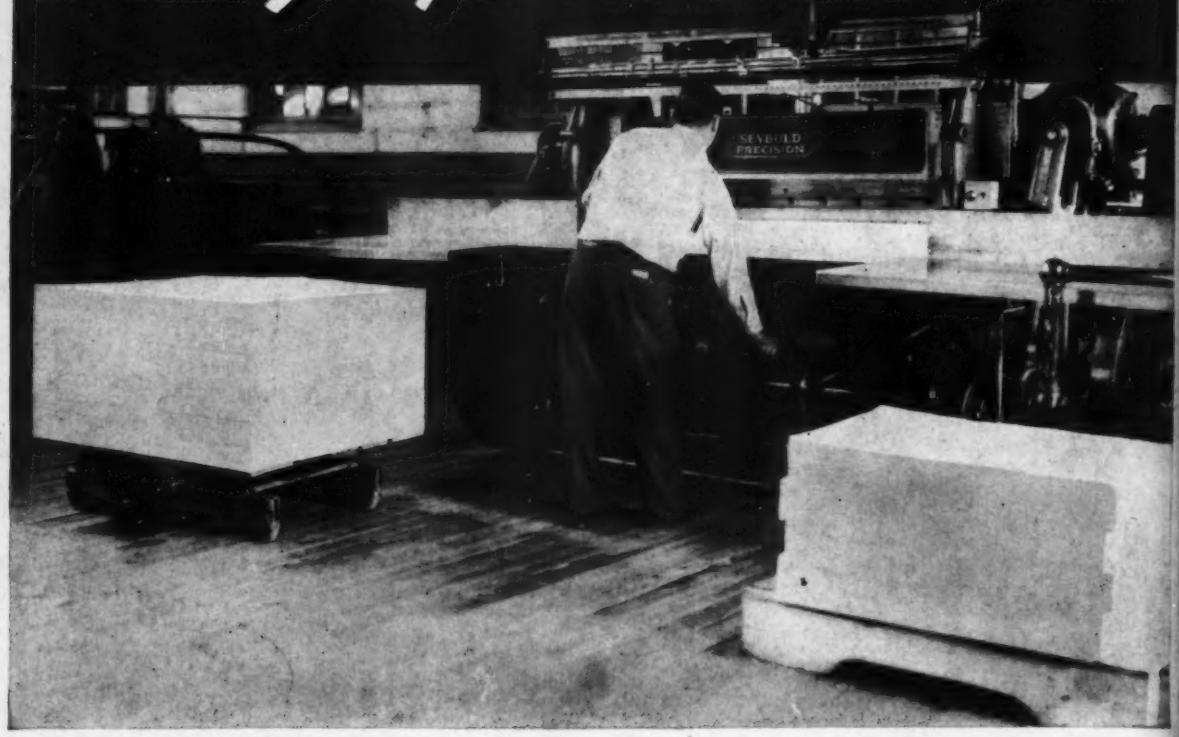
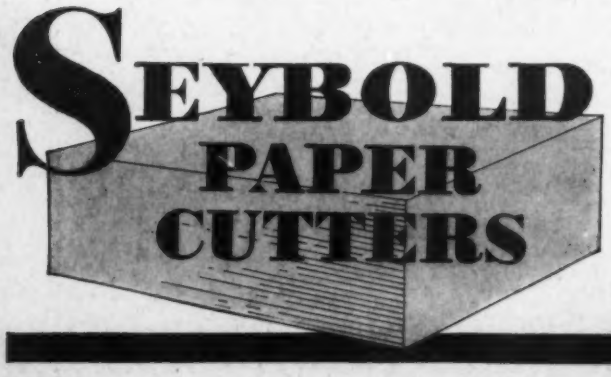
Timely Tips on Cutter Care



6 Simple Points to Observe in "Cutter Care"

1. ***Instruct operators*** to keep a Seybold Paper Cutting Machine CLEAN. Dust and dirt should be removed EVERY DAY to avoid unnecessary wear on working parts.
2. ***Keep it lubricated.*** Oil holes and cups should be free of dirt and grit and only *high quality, clean* lubricants should be used. Grease in gears should be replaced before it hardens or cakes. *Excessive* quantities of lubricants should be avoided.
3. ***Keep Cutting Knife Sharp.*** A dull knife puts undue pressure on the operating parts of the machine. Have knives resharpened.
4. ***Inspect Clamp Pressure Mechanism.*** Failure to maintain correct clamping pressure on an automatic paper cutting machine can cause breakage of parts.
5. ***Inspect Driving Clutch and Brake*** regularly to maintain proper adjustment. Failure to do this not only wastes power but causes needless wear on the indicated mechanisms.
6. ***Check Table*** regularly for accurate alinement and, at the same time, inspect *Back Gauge* to make sure it is *parallel* with the cutting knife.



DIVISION

HARRIS • SEYBOLD • POTTER COMPANY

819 Washington Street • Dayton, Ohio

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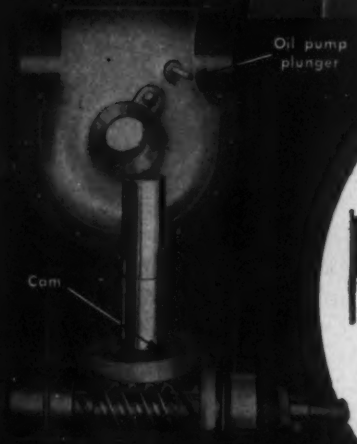
VALLEY FORGE WAS A TOUGH JOB, TOO!
Long hours and short rations are not the American standard, by a long shot. But American history holds more than one chapter of bone-weary work, courageous enterprise and sacrifice. General Washington and his ragged band of heroes at Valley Forge set a sterling example, for one. American workers and civilians are setting another. On the home front, the factory front, the fighting front, Americans are doing the tough jobs that must be done—as Americans have done them before. Valley Forge was a tough job, too!
Buy War Bonds for Victory!
BELOIT IRON WORKS
PAPER MACHINERY
BELOIT, WIS., U.S.A.
SERVING UNCLE SAM
1ST
FOR THE DURATION
WHEN YOU BUY BELOIT . . . YOU BUY MORE THAN A MACHINE!
BELOIT
BELOIT IRON WORKS, BELOIT, WIS.

DE LAVAL
WORM GEARS
require little attention

Tow-boat capstan driven from De Laval worm gear

Motor drive through De Laval vertical drive worm gear and spur gear to capstan

Vertical drive worm gear with cover lifted



The two working parts are enclosed in a moisture-and dust-proof housing and run in a bath of oil. Where splash lubrication is not dependable, an oil pump is provided, as for the upper bearing of the vertical shaft drive here shown. No attention is required other than to check the oil level at long intervals.

Power is transmitted by a continuous, shockless, wedging action, with contact at all times between three or more pairs of teeth, which are subject to compression rather than bending.

The case-hardened steel worm, the wheel of bearing bronze and copious lubrication insure high efficiency, long life and unequalled reliability.

Describe requirements and ask for Publication W-1137.

DE LAVAL WORM GEAR DIVISION

of the De Laval Steam Turbine Co., Trenton, N. J.

MANUFACTURERS OF TURBINES · STEAM, HYDRAULIC PUMPS · CENTRIFUGAL, PROPELLER ROTARY, DISPLACEMENT, MOTOR MOUNTED, MIXED FLOW, CLOGLESS, SELF PRIMING CENTRIFUGAL BLOWERS and COMPRESSORS · GEARS · WORM, HELICAL and FLEXIBLE COUPLINGS

PAPER TELLS THE STORY

MAYBE they can't read English, but these Fiji Islanders still find plenty of interest in this copy of "LIFE." From winning native friendship to recording Army orders . . . paper is vital in war.

To meet the demands for paper and paper products, leading mill operators everywhere are assuring maximum output . . . by lubricating their equipment with Texaco.

Texaco Ursa Oil in the circulating systems of dryers and calenders keeps bearings cool. Resisting breakdown and sludging, *Texaco Ursa* insures a full supply of clean oil to all bearings.

So effective have Texaco Lubricants proved that they are definitely preferred in many important fields, a few of which are listed in the panel.

A Texaco Lubrication Engineer will gladly cooperate in the selection of the most suitable lubricants for your plant . . . just phone the nearest of more than 2300 Texaco distributing points in the 48 States, or write to:

The Texas Company, 135 East 42nd Street, New York, N. Y.

THEY PREFER TEXACO

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and railroad cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated and fueled with Texaco than with any other brand.

TEXACO

TEXACO Lubricants

FOR THE PAPER INDUSTRY

TUNE IN FRED ALLEN EVERY SUNDAY NIGHT—CBS ★ HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

Cool as a Cucumber

—AT 6 MILES A MINUTE!

MEET the fighter that's blasting the Axis out of the sky! It rockets along at better than 400 miles an hour . . . powered by a liquid-cooled engine. Ethylene glycol (permanent anti-freeze to you!) is an important factor in its cooling system.

Chlorine, prime processing agent in the manufacture of ethylene glycol, is but one of the many Mathieson products which are contributing directly to the production of war materials. To mention only a few of the essential war uses of Mathieson chlorine, it plays an important part in the manufacture of aluminum . . . plastics . . . synthetic rubber . . . petroleum products and high explosives. Other basic "war chemicals", manufactured by The Mathieson Alkali Works and supplied directly to war industries or to our armed forces, include caustic soda, ammonia, soda ash, carbon dioxide and calcium hypochlorite. A highly mobile, dry chlorine carrier, calcium hypochlorite is used extensively at training centers and other military establishments to combat the deadly menace of waterborne diseases.

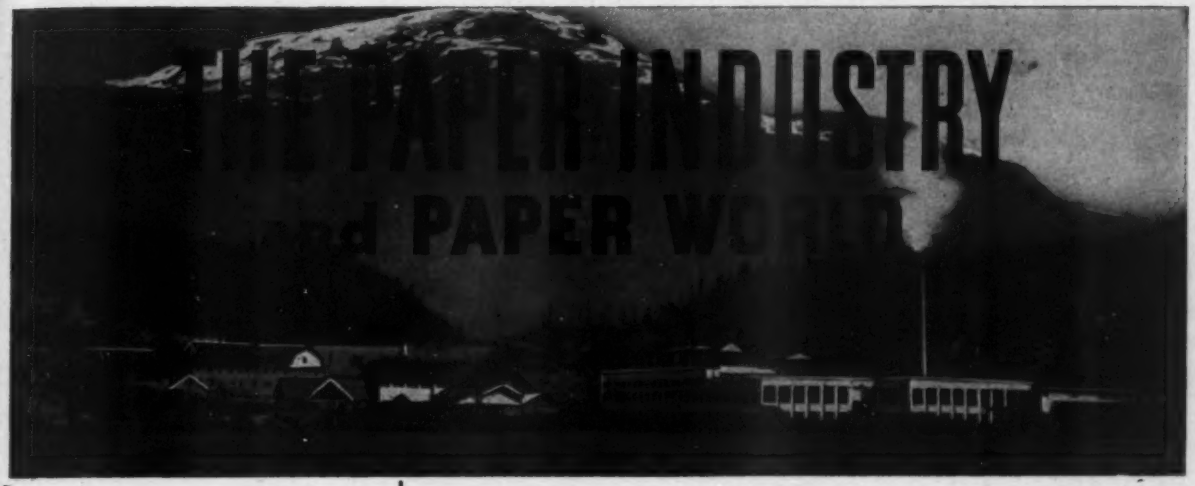
In a larger sense, Mathieson Chemicals are fighting a menace greater and more deadly than any the world has ever known—the arrogant, over-weening ambitions of the Axis tyrants, men without conscience and without mercy. Until they are removed forever from the high places of evil, there can be no let-up in the pace of war production here at Mathieson.

For outstanding achievement in the production of war materials.

Mathieson CHEMICALS

THE MATHIESON ALKALI WORKS (INC.)
60 EAST 42ND STREET, NEW YORK, N. Y.

LIQUID CHLORINE . . . SODA ASH . . . CAUSTIC SODA . . . BICARBONATE OF SODA . . . BLEACHING POWDER . . . HTH PRODUCTS . . . AMMONIA, ANHYDROUS and AQUA . . . FUSED ALKALI PRODUCTS . . . SYNTHETIC SALT CAKE . . . DRY ICE . . . CARBONIC GAS . . . SODIUM CHLORITE PRODUCTS



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Before Inventive Genius Was Applied to Paper Making

Ton production wasn't in the mind of the paper maker whose 1778 workshop made paper sheet by sheet. He was an artist, surrounded by apprentices and a few tools of his trade. But, one day inventive genius was applied to his art. Machines were developed; the art became an industry. Tons were produced where only sheets were made before. The felt layers used to remove water from the sheets, too, gave way to production felts. Since then progress in felt making has kept pace with progress in paper making. Appleton Felts have since 1890 each year met all requirements of paper mill production—today preferred by mills everywhere.

make APPLETON FELTS good paper

This advertisement is a continuation of a series started in 1940 depicting early history of paper making.

Appleton Woolen Mills

APPLETON • WISCONSIN

ENEMIES of Freedom

Those who seek to destroy freedom are in reality afraid of it.

Since freedom is a part of human destiny it must be maintained at all costs. It will be maintained if we place our destiny in the hands of men who are not afraid to fight to be free.

These men are the men who now need all the rubber available, which explains why we whose business it is to make rubber products for civilian uses can no longer obtain our normal supply of crude rubber.

Therefore, you the distributor, and you the dealer can no longer buy our products as freely as you did.

We eagerly look forward to the day when victory is won and we shall be able to manufacture products and serve you as we have for more than 60 years.

BOSTON WOVEN HOSE AND RUBBER COMPANY

BOSTON WOVEN HOSE AND RUBBER COMPANY

WORKS: CAMBRIDGE, MASS., U. S. A.
P. O. BOX 1071, BOSTON, MASS., U. S. A.

Little Things Make A Big Difference

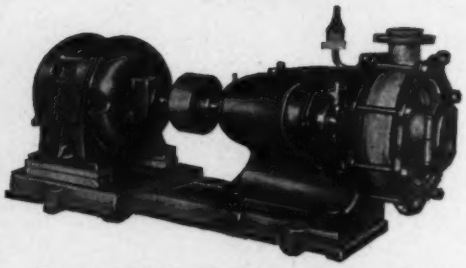
Your finger print may look like the other fellow's . . . but the expert knows there are very important differences.

In the same way, all centrifugal pumps follow the same ages-old principle.

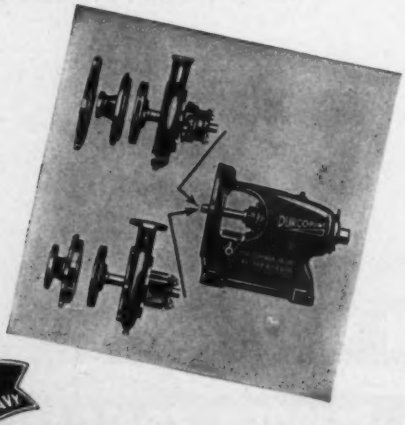
But Durco Model 40 pumps have exclusive characteristics as important as the swirls in finger prints.

Fitting a standard base, the wet end parts . . . that is the volute, impeller and cover . . . are so designed that they may not only be easily replaced; they also may be interchanged with similar parts in another Durco alloy.

This means that a Model 40 Durcopump made of Duriron handling alum solutions in your present processes may be converted to Durichlor to handle hypochlorite bleach, if desired, or to Durimet or other stainless steels for hot, weak sulphuric acid or hot sulphite liquors.



The convertible feature of Durcopumps provides a corrosion-resistant centrifugal pump that will handle acid solutions all along the pH scale.



But this is not all. Model 40 pumps are new, modern, streamlined. All unessentials have been eliminated. Their silhouette is indicative of good engineering. Their efficiency rating is high. They are made in several sizes with capacities up to 2000 gpm. and for heads up to 135 ft.

The design facilitates maintenance and adjustments; all parts are easy of access.

A positive suction is maintained on the stuffing box. The impeller may be open or closed type. The impeller shaft is carried on sleeves through ball bearings that are fully protected from acid fumes, moisture, dust and other foreign matter.

Whenever you have need for a pump to handle corrosive solutions, it will pay you to get the details of the Model 40 Durcopump. Write for Bulletins.

ARMY E NAVY

DURIRON · DURICHLOR
CORROSION RESISTING
DURCO
ALLOYS & EQUIPMENT
THE DURIRON CO. INC. DAYTON OHIO
DURIMET · DURCO STAINLESS STEELS

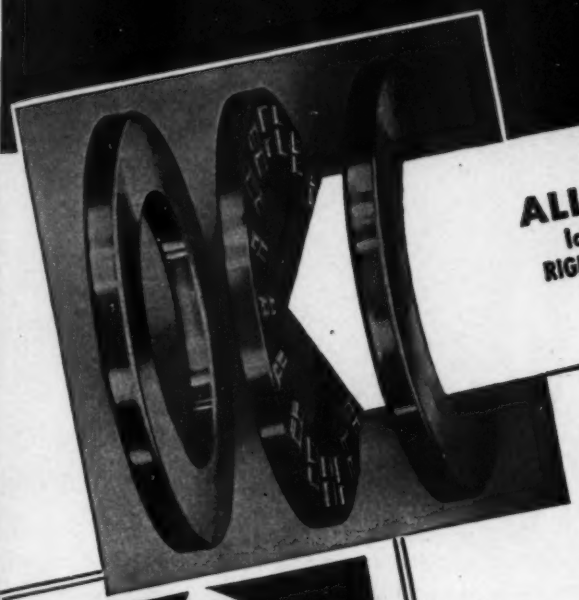
THE DURIRON COMPANY, INC. DAYTON, OHIO, U.S.A.

This Basic Bearing Principle

cuts the production hours lost through machine failures

ALL RADIAL loads carried at RIGHT ANGLES to the roller axis.

NO OBLIQUE RESULTANTS



ALL THRUST loads carried at RIGHT ANGLES to the roller axis.

ROLLWAY

RIGHT-ANGLE ROLLER BEARINGS

With machines running continuously to maintain war schedules... with no cooling-off period... the life of the ordinary bearing is sharply reduced. Lost man-hours pile up while machines shut down for bearing maintenance and repairs. What is the remedy? It's really simple. Just reduce the magnitude of the load and the complexity of the stresses *per bearing*.

Do it easily and economically the Rollway Right-Angled way. These heavy-duty, precision bearings stand up longer and afford greater carrying capacity in given dimensional limits. That's because they split the load into its two simplest components of *pure radial* and *pure thrust*, carrying each of these on a separate bearing assembly. Every load is supported at right angles to the roller axis. There are no oblique resultants to complicate design, no wedging or pinching of rollers, less rubbing friction and wear-back of the roller heads.

For longer bearing life, more efficient performance and more economical maintenance . . .

FOLLOW THIS BASIC BEARING PRINCIPLE

- All radial loads carried at right angles to the roller axis.
- All thrust loads carried at right angles to the roller axis.

Standard Sizes for Most Applications

S.A.E. or American Standard metric dimensions and tolerances in a wide range of sizes and types assure low cost and ready availability for most applications without special design. Let our engineers recommend the types best suited to your needs. Send us your original design or change-over sketch for free, confidential bearing analysis. No obligation.

ROLLWAY BEARING COMPANY, INC., SYRACUSE, NEW YORK

BUILDING HEAVY-DUTY BEARINGS SINCE 1908 — BEARINGS

TO HIT 'EM H-A-R-D-E-R

THE year 1943 promises to be the grimmest, hardest year this country has ever faced. Every effort, and every dollar of national income not absolutely needed for existence, should go into war work and War Bonds.

In the Pay Roll Savings Plan, America finds a potent weapon for the winning of the war—and one of the soundest guarantees of the preservation of the American way of life!

Today about 30,000,000 wage earners, in 175,000 plants, are buying War Bonds at the rate of nearly half a billion dollars a month. *Great as this sum is, it is not enough!* For the more dollars made available now, the fewer the lives laid down on the bloody roads to Berlin and Tokio!

You've undoubtedly got a Pay Roll Savings Plan in your own plant. But how long is it since you last checked up on its progress? *If it now shows only about 10% of the gross payroll going into War Bonds, it needs jacking up!*

This is a *continuing* effort—and it needs *continual* attention and *continual* stimulation to get fullest results.

You can well afford to give this matter your close personal attention! The actual case histories of thousands of plants prove that the successful working out of a Pay Roll Savings Plan gives labor and management a common interest that almost inevitably results in better mutual understanding and better labor relations.

Minor misunderstandings and wage disputes become fewer. Production usually increases, and company spirit soars. And it goes without saying that workers with substantial savings are usually far more satisfied and more dependable.

And one thing more, these War Bonds are not only going to help win the war, they are also going to do much to close the dangerous inflationary gap, and help prevent post-war depression. The time and effort *you* now put in in selling War Bonds and teaching your workers to save, rather than to spend, will be richly repaid many times over—now and when the war is won.

★ ★ ★

You've done your bit Now do your best!

This space is a contribution to victory today and sound business tomorrow by THE PAPER INDUSTRY and PAPER WORLD

COLOR MAKES THESE BANK FORMS TALK

THESE record forms serve a bank's Central Information File better, quicker, more accurately—because of color.

In small office or huge warplant, color serves equally well. Color distinctions on record forms, orders, job tickets, tags and labels speed processing, production and shipping—minimize errors, provide quick, accurate identification.

Color helps employees step up their output—guides new workers to a quicker understanding of their jobs. But paper and the dyestuffs that make it "talk" should be selected carefully—made to work with utmost effect in their million and one jobs—applied with an eye toward conservation.

Today's new paper products and specialties create additional new color problems. To help you meet these changing conditions, Du Pont Dyestuffs technicians offer the knowledge gained from years of experience with dyes, paper, and proper application. They can help you unite paper and colors most effectively —most economically. E. I. du Pont de Nemours & Co. (Inc.), Organic Chemicals Department, Dyestuffs Division, Wilmington, Delaware.

DU PONT DYESTUFFS

DYESTUFFS

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Keeping every ounce of vitally needed Monel on the job is essential today.

Mills which have scrapped Monel *binding and winding wire* can put it to work in another form as a conservation measure.

The transformation of this discarded wire into gas welding rods permits re-use of valuable Monel for maintenance and repair work, and for the rebuilding of worn pump shafts, impellers, agitator shafts, and the like.

A method for preparing and using discarded Monel wire for gas welding rods is described below.

For full information on gas welding Monel, write for Bulletin T-2, "Welding, Brazing and Soft Soldering of Monel, Nickel and Inconel." The International Nickel Company, Inc., 67 Wall Street, New York, N. Y.

GAS WELDING WITH MONEL RODS

made from discarded binding and winding wire

1. PREPARATION OF MONEL WELDING RODS FROM WIRE . . .

First cut the wire into 3 foot lengths and straighten them. Then clean them as follows:

A. Brush with a wire brush or clean with fine emery cloth.

B. Immerse the wire for about 10 minutes in an earthenware jar filled with warm (120° F.) 5% hydrochloric (muriatic) acid solution. After a rinse in water, the resulting clean wire is ready for use as a gas welding rod.

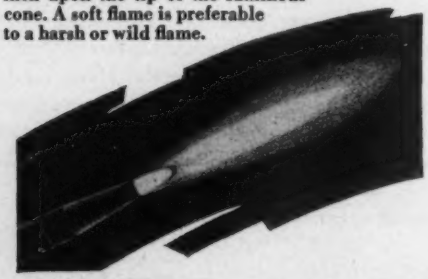
2. GAS WELDING

A. Flux—Monel Gas Welding Flux should be used. If lack of sufficiently high priority prevents this, any available brazing flux may be used, though the results may not be as satisfactory.

The flux should allow the metal to flow freely and produce a smooth weld...not burned-looking ... and one free of gas holes.

Borax, or fluxes containing large amounts of borax, are not recommended. They tend to produce a Monel weld which may be brittle.

B. Flame—A slightly reducing (carburizing) oxyacetylene flame is recommended, with just a little excess acetylene as indicated in illustration. There should be only a slight feather not larger than 1/16 inch upon the tip of the luminous cone. A soft flame is preferable to a harsh or wild flame.



C. Welding—Monel weld metal should not be puddled. The molten pools of weld metal should be kept quiet with the tip of the luminous flame just touching its surface.

The end of the welding rod always should be kept well within the protecting flame envelope as this prevents oxidation of the rod during welding.

(Write for bulletin T-2, mentioned above, for full welding information.)

3. REBUILDING OF WORN PARTS

Gas welding may be used for rebuilding of pump shafts, impellers and similar equipment, although electric arc welding or metallizing is preferable.

A worn pump shaft may be rebuilt by Monel gas welding as follows:

A. Remove all grease, dirt and corrosion by rough machining or wire brushing of shaft surfaces to be built up.

B. Set up the shaft on rollers or centers so that it may be rotated easily.

C. Warm the area to be built up uniformly as the shaft rotates slowly.

D. Deposit the weld metal circumferentially, as shown in illustration. This will produce a shaft with less distortion than one on which the weld metal has been laid down parallel to the long axis of the shaft. The weld should be about ¼ inch to ⅜ inch wide, but not over ½ inch wide.

E. Machine the built-up area down to desired diameter. No special cutting tool is required. A high speed tool is preferable, but a plain carbon steel tool is satisfactory for the limited amount of machining.

Questions concerning the conservation of equipment by welding will be answered by INCO's TECHNICAL SERVICE. A copy of the article "How to Recondition Worn Pump Shafts and Rods," will be sent on request.

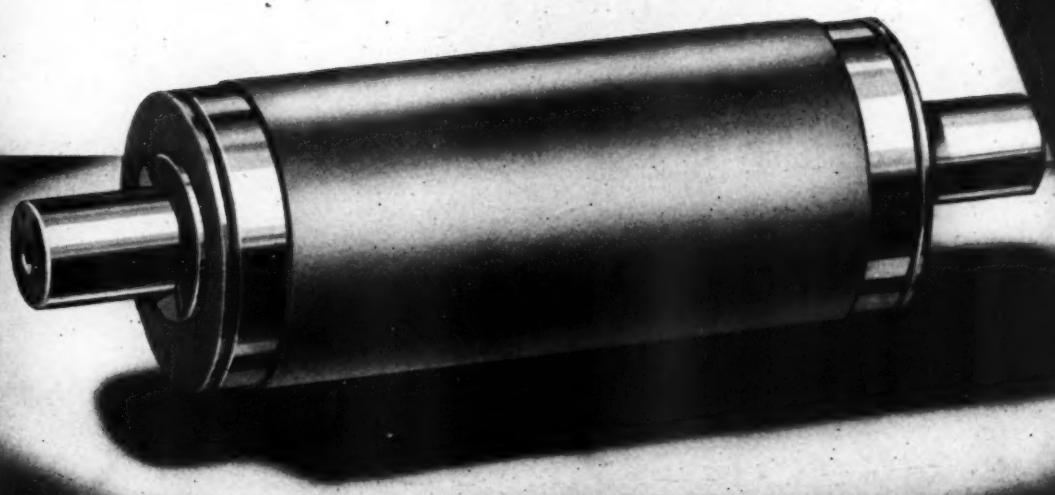
INCO NICKEL ALLOYS

MONEL • "K" MONEL • "S" MONEL • "R" MONEL • "KR" MONEL • INCONEL • "Z" NICKEL • NICKEL

Sheet . . . Strip . . . Rod . . . Tubing . . . Wire . . . Castings

PERKINS

THERE IS
NO
SUBSTITUTE
FOR
PERKINS
QUALITY



B. F. PERKINS & SON, INC.

ENGINEERS AND MANUFACTURERS

HOLYOKE • • • MASSACHUSETTS

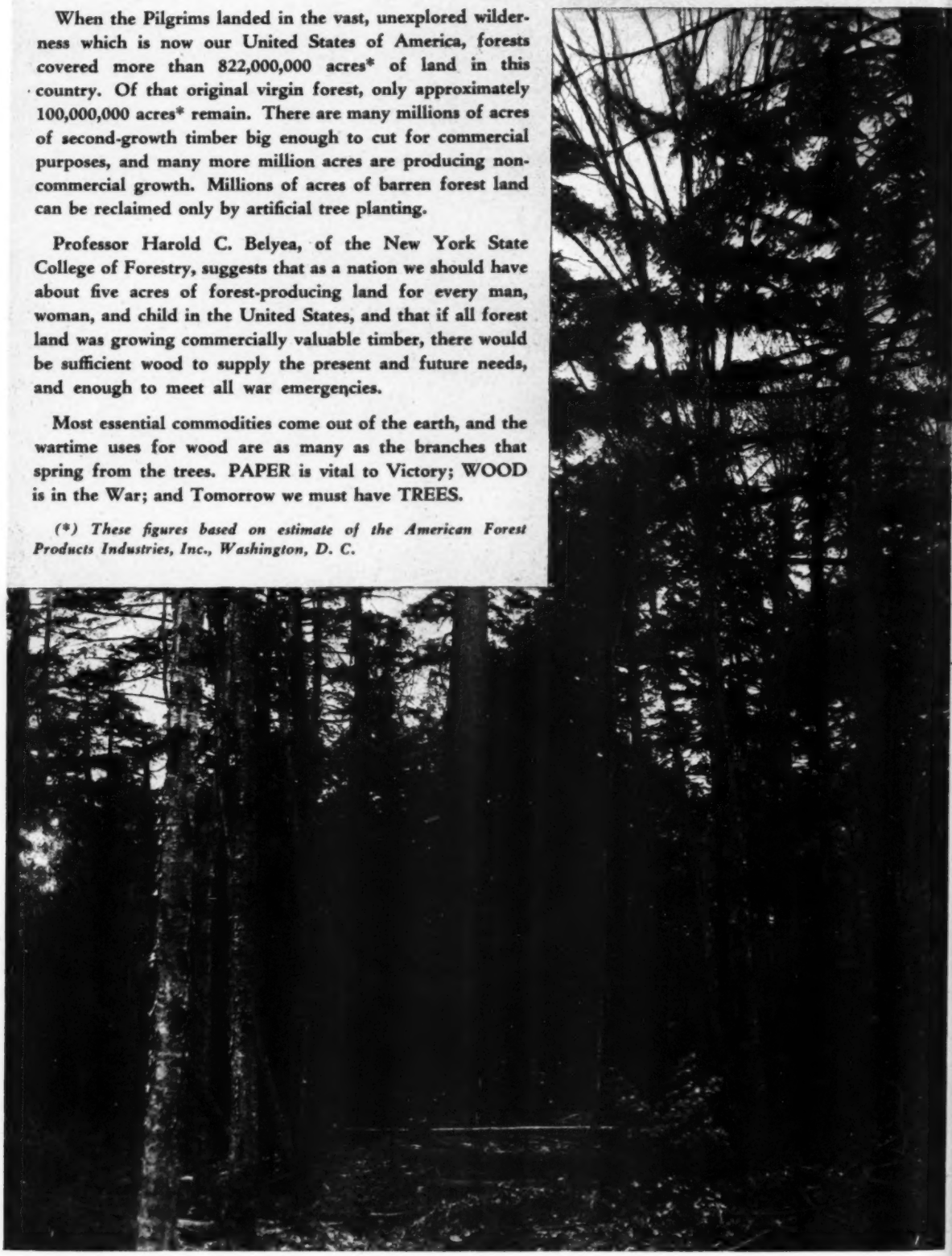
Trees . . . Wartime Wood and Peacetime Forests

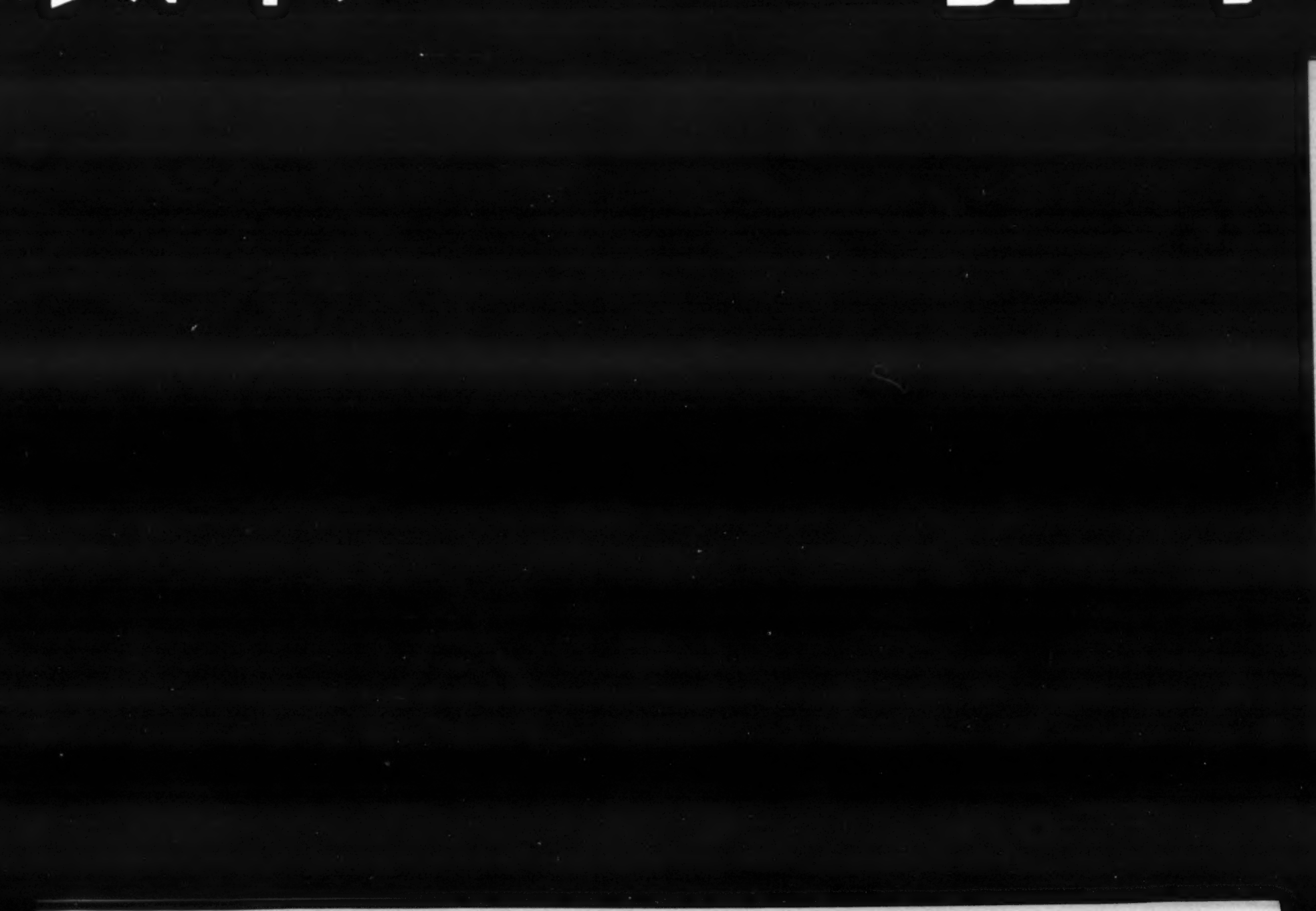
When the Pilgrims landed in the vast, unexplored wilderness which is now our United States of America, forests covered more than 822,000,000 acres* of land in this country. Of that original virgin forest, only approximately 100,000,000 acres* remain. There are many millions of acres of second-growth timber big enough to cut for commercial purposes, and many more million acres are producing non-commercial growth. Millions of acres of barren forest land can be reclaimed only by artificial tree planting.

Professor Harold C. Belyea, of the New York State College of Forestry, suggests that as a nation we should have about five acres of forest-producing land for every man, woman, and child in the United States, and that if all forest land was growing commercially valuable timber, there would be sufficient wood to supply the present and future needs, and enough to meet all war emergencies.

Most essential commodities come out of the earth, and the wartime uses for wood are as many as the branches that spring from the trees. PAPER is vital to Victory; WOOD is in the War; and Tomorrow we must have TREES.

(*) These figures based on estimate of the American Forest Products Industries, Inc., Washington, D. C.





TRADE WINDS

"Essentiality" Applied to Pulp and 28 Types of Paper and Board

▸▸▸ THE LONG-AWAITED CLASSIFICATION of the pulp and paper industry as "essential" has now become official. The recent ruling of the War Manpower Commission (Activity and Occupation Bulletin No. 27) lists as essential activities the production of pulp, 28 types of paper stock and paperboard. This ruling also covers some paper and paperboard converted items and a list of other materials used for shipping and preserving essential products.

Paper production has been threatened by a shortage of manpower which has affected the industry beginning with woods operations. If production is to be geared to the demands of wartime, pulpwood procurement must be adequately "manned." A slight confusion has arisen over the essentiality rating of pulpwood due to a technical error in Bulletin No. 7 issued by the War Manpower Commission. This bulletin is headed "Forestry, Logging and Lumbering." Mr. Arthur Wakeman, director of the Pulp and Paper Division of the WPB, has taken steps to have this oversight corrected, and the American Paper and Pulp Association quotes Mr. Wakeman as follows:

"According to information received from the War Manpower Commission, all local Selective Service Boards have now been informed that when the list of essential activities was issued in December, 1942, the listing of 'Forestry, Logging and Lumbering' was intended to include 'Pulpwood Cutting,' and will now be amended so to read.

This interpretation will be of great help to the cutters of pulpwood, as many in that vocation believing they were not in an essential industry either returned to farming or another essential occupation, thus curtailing the number of available wood cutters, and reducing the production of wood. The consequence of this is, of course, a reduction in pulp and its end product, paper, so urgently needed."

The Activity and Occupation Bulletin No. 27 is composed of three parts: Part I—Policies that apply to this activity; General policies that govern this activity; Part II—Essential activities; and Part III—Essential occupations. The 28 types of paper stock and paperboard covered in Part II of the bulletin are shown in the accompanying list.

Word comes from the Northwest that more manpower must be available for logging, or woods operations during 1944 and 1945 will be seriously affected. It is also said that from 20-25 per cent of the men employed in the western logging industry are continually employed for development and preparatory work such as road and bridge building, and camp operations; falling and bucking timber ahead in order to build up "cold deck" reserves of logs. For years the logging industry has built up a large reserve of such development which aids materially in feeding the pulp mills during off seasons. To duplicate this reserve, in one area alone, a news contributor has estimated it would require 3,000,000 man-days of labor, which would require a year's work on the part of 10,000 men. It is estimated there are from 2,000 to 4,000 loggers short of the required number in the timber stands of British Columbia alone. Western Washington operators have had 614 experienced woodsmen come forward to fill 1,782 vacancies. The same reporter claims that the states of Washington and Oregon woods industries have 1,700 loggers and lumber workers on their payrolls. Most workers reporting are fallers and buckers. There is an urgent need for riggers, tractor drivers, rigging men and other experienced woodsmen.

Essential Activities

A. Production of the following pulp, paper, paperboard, and converted products:

1—Pulp (made from pulpwood and other substances).

2—The following types of paper stock and paperboard:

Absorbent for impregnation	Drafting	Toweling stock
Asphalt laminating	Filter	Toilet tissue stock
Blueprint	Gasket	Napkin stock
Box board	Glassine	Hospital wadding stock
Cable insulation	Greaseproof	Shipping sacks stock
Carbonizing	Gumming	Tabulating card stock
Chart and map (Govt.)	Photographic and other sensitized	Tracing
Condenser tissue	Safety base stock	Vegetable parchment
Container board	Sanitary napkin stock	Waxing
		Wet machine board

-from Washington

▶▶▶ THE WHOLE SITUATION in the paper industry is becoming critical, through a basic shortage of pulp, which in turn is based on a shortage of pulpwood. As a result the War Production Board has ordered all pulp producers to withhold 20 per cent of all the pulp they manufacture for allocation to mills needing material with which to operate. Whether or not this withheld pulp will be taken from self contained mills to supply converter mills is not decided, as the withholding order is intended to assure adequate supplies for all mills making essential paper.

▶▶▶ THE PULPWOOD SITUATION is difficult. A combined campaign is under way through pulpwood consumers, printing paper consumers and the War Production Board to encourage the cutting of farm wood as an added income for owners. The campaign is for the present aimed at informing the farmers of the possibilities through the use of agricultural publications.

▶▶▶ THE MANUFACTURE OF WALLPAPER pattern rolls containing new designs is prohibited under order No. L-177 as amended, effective July 1. WPB restricted the wallpaper industry to those patterns produced in the 1942-43 season and fixed base paper consumption at 60 per cent of the tonnage used in 1941-42. The 60 per cent production in the coming season will approximate 246,000,000 rolls of wallpaper, and in addition the mills will probably carry over inventories of approximately 30,500 rolls.

▶▶▶ CHARGES ARE CONSTANTLY BEING bandied about Washington to the effect that the Government should apply the same conservation policies in its use of paper that are required of commercial users. In one statement in Congress a representative charged that the Government is the greatest paper waster in the country. The fact that the current call for paper bids for the Govenment Printing Office is much in excess of recent requests may or may not have a bearing on this situation. The call for bids for the three months beginning July 1 is for 78,450,000 pounds. The bids asked for the current six month period were 115,545,000 pounds.

▶▶▶ THE PULPWOOD CONSUMERS, Government agencies, and the agricultural press are co-operating in a national campaign to encourage the production of pulpwood by farmers owning woodlots. The OPA has placed pulpwood cut in South Carolina, Georgia, and Florida under specified price ceilings. It has also made permanent the sixty-day freeze on pulpwood prices established March 5 in Kentucky, Virginia, North Carolina, Tennessee, Alabama, Louisiana, Texas, Arkansas, and Mississippi. In general, these ceilings are at the levels which prevailed during the freeze period.

▶▶▶ GREETING CARDS are affected by Order No. L-289, effective May 20, which limits the variety and tonnage for the duration. Paperboard for packaging and display of the cards is also curtailed. The order provides that none of the 100-odd publishers of commercial greeting cards conveying personal messages or holiday, anniversary, or valentine wishes may produce during the balance of 1943, or in any calendar year thereafter, more than 60 per cent of the new designs produced during 1942, or reproduce more than 80 per cent of the old designs from plates on hand. Use of cards and paper is limited each quarter to 60 per cent of weight in corresponding quarters of 1942.

▶▶▶ THERE IS A SHORTAGE of casein, the paper industry normally using about 25,000,000 pounds per year, which is approximately the total available supply for 1943. The industry uses about 80 per cent of the consumption, so allocation procedure is being followed to prevent unnecessary use of this material.

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NEW BUREAU WILL STUDY THE NATION'S PLANT FACILITIES

A Facilities Bureau has been organized for the purpose of ascertaining that the maximum utilization is obtained from the nation's existing plant facilities and to plan for the minimum amount of new construction. Charles E. Volkhardt has been named director, and there will be four units: Office of the Director, Project Division, Production Resources Division, and Progress and Scheduling Division, replacing the Facilities Program Division, Construction Division, and Facilities Division. Realignment of the Facilities Bureau has been carried out to provide a close-knit organization to administer the new WPB policies controlling future facility expansion.

The Construction Division, which has been located in New York, will be transferred to Washington, where it will be absorbed into the Project Division. Transfer is expected to be completed by June 30. The Facilities Division, which as such was abolished by the organization order, will become the Productiotn Resources Division. The names of division directors and their deputies have not been announced.

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PULPWOOD CONSUMING MILLS ORGANIZE WAR PRODUCTION COMMITTEE

Pulpwood consuming mills have organized a new committee—the War Production Committee of the Pulpwood Consuming Industries—to supplement the efforts of the War Production Board and Department of Agriculture Extension Service in increasing supplies of pulpwood on farms for vital war uses.

Frank Block is national director of the committee, H. E. Brinckerhoff is executive secretary and treasurer, and Rand W. Sutherland will direct the publicity program.

The committee is composed of: H. P. Carruth, vice president, Union Bag and Paper Corporation; Stuart B. Copeland, president, Northwest Paper Company; Amor Hollingsworth, president, Penobscot Chemical Fibre Co.; H. E. Houghton, vice president, Brown Company; R. W. Hovey, vice president, Oxford Paper Company; H. M. Kieckhefer, secretary-treasurer, North Carolina Pulp Company; David L. Luke, Jr., vice president, West Virginia Pulp and Paper Company; James L. Madden, vice president, Hollingsworth and Whitney

Important Notice! Postal Zone Classification

Due to reduced personnel, a large number of cities and towns have been listed by the Government for postal zone classification. The use of the zone number in which an addressee is located will facilitate the delivery of mail and help to relieve congestion in the postal system.

All first class mail and parcel post addressed to Fritz Publications, Inc., THE PAPER INDUSTRY AND PAPER WORLD, and *Paper and Pulp Mill Catalogue,* or any member of their staffs, should be addressed to 59 East Van Buren Street, Chicago 5, Illinois.

The office of these publications will appreciate it if advertisers and regular correspondents will show *their* zone numbers on their correspondence so that this information may be added to all mailing lists.

PAPER · · · America's 6th Industry

PLANE PARTS IN PAPER BAGS

(NEWS ITEM: *In a midwest plant, delicate instruments for U. S. fighter planes are being protected by paper bags as they move down the assembly line.*)

Paper bags are playing a unique role in guarding magnetos for America's war planes.

As these intricate plane parts move down the assembly line in a midwest plant, they are protected from dust by paper bags.

Waterproof paper bags are needed in tremendous quantity for the shipment of repair parts for planes, tanks and guns . . . bags that can withstand storage for long periods of time and exposure to any climate.

The Paper Industry is supplying all the paper bags needed by America at war as well as packaging for food, equipment and munitions to our Armed Forces overseas. Puseyjones engineers offer their whole-hearted cooperation to these mills meeting the demands of the war effort.

The improved Puseyjones Winder for all-purpose machines gives the necessary speed-up in the winding operation and meets the commercial demand for large shipping and converting rolls. The latest mechanical improvements, including an individual motor drive for the rider roll and each drum roll, and a time-saving shaft replacement device, simplify operation.

Puseyjones men and production facilities are on war work. In the meantime, we are doing our best to supply replacement parts to keep present equipment operating efficiently. All orders subject to priority conditions of War Production Board.

PLANNING AHEAD? For paper and pulp mill executives looking forward to post war production problems, we will gladly furnish reprints of three informative articles prepared by Puseyjones engineers — "The Post-War Fourdrinier Machine," "Development of Stream-Flow Vat System," "The Flow Spreader." Ask for reprints by name.

THE PUSEY AND JONES CORPORATION

Established 1848. Builders of Paper-Making Machinery

Wilmington, Delaware, U. S. A.

THE SIGN OF SUPERIOR QUALITY

Company; Eustis Paine, president, New York and Pennsylvania Company; and Vertrees Young, executive vice president, Gaylord Container Corporation. Headquarters are located at 30 Rockefeller Plaza, New York City.

◆

"ABSENTEEISM" SUBJECT OF NEW WPB GUIDEBOOK

Absenteeism, its causes and remedies, is the subject of a new guidebook recently issued to Labor-Management War Production Drive Committees in more than 2,000 war plants by War Production Drive Headquarters of the WPB in Washington, and will be available to other war plants upon request.

The pamphlet is entitled, "Guide for Plant Labor-Management Production Committees," and is based on extensive war plant experiences which have been submitted by Labor-Management Production Committees, as well as on field surveys made by representatives of the Labor Production Division.

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▶▶▶ ACCORDING to the American-Swedish News Exchange, Inc., New York City, the lumber, wood pulp and paper industries in Sweden have suffered to a considerable degree from the Skagerack blockade, as by far the larger part of their production was exported to Great Britain and the Western Hemisphere.

◆

TACOMA PLANT OF RAYONIER ACQUIRED BY BAGLEY & SEWALL

Announcement has just been made that Bagley and Sewall Company, of Watertown, New York, has purchased the plant of Rayonier, Inc., Tacoma, Washington. The announcement reveals that negotiations on this deal were made in April.

The Tacoma plant was shut down in November, 1942, as the result of WPB Order M-251, issued October 23, 1942, which restricted operation of pulp mills in the Puget Sound area. This order effected the withholding of logs from and restricted deliveries of pulp by Rayonier, Inc., Tacoma, St. Regis Paper Company, Tacoma, and the Anacortes, Washington, mill of Scott Paper Company. The order became effective November 1. It was claimed the order was necessitated by a shortage of manpower in that area, the restriction of Canadian pulpwood, and the increasing diversion of pulp logs for lumber purposes.

Before the shutdown, the Rayonier plant at Tacoma produced about 150 tons of unbleached sulphite pulp per day which was processed at the company's mill in Shelton, Washington.

The Bagley and Sewall Company states it has a representative at Tacoma supervising the dismantling of the plant and disposal of the equipment.

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FINANCIAL

▶▶▶ The strike situation and other unfavorable developments caused a lower trend in the securities markets during May, but the paper industry securities did not reflect the entire weakness shown in many of the war industry shares. In the paper industry there was a distinct trend upward for the preferred interest bearing stocks as against a slight weakness in many of the cheaper common stocks.

American Writing Paper Corporation—Net profit for the first three months of 1943 was $54,134 as against $141,587 for the same quarter in 1942.

Continental Diamond Fibre Company—Net profit for the March quarter was $165,669 as against $106,912 for the same quarter in 1942.

Flintkote Company—Net income for twelve weeks ending March 27 was $244,224 as against $306,490 for the corresponding period in 1942.

Robert Gair Company—Net profit in the March quarter was $154,199 as compared with $354,208 for the same quarter in 1942.

Great Northern Paper Company—Net income, including subsidiaries, for the quarter ended March 31 was $206,167 as compared with $425,880 for the same period in 1942.

Hammermill Paper Company—Net profit for 1942 was $551,389 as against $671,401 in 1941.

Hinde & Dauch Company—Net profit for the March quarter was $241,467 as compared with $262,537 in the same quarter of 1942.

Hollingsworth & Whitney Company — (Correction) — The information given for this company in this department of the May issue was in error. The stockholders received $2.50 per share instead of $3.39 as stated. The *earnings* of the company were $3.39 per share.

International Paper Company—Consolidated net profit for the three months ended March 31 was $2,023,118 as compared with $2,469,895 for the corresponding period in 1942.

Lily-Tulip Cup Corporation — Net profit for the fiscal year ending March 31 was $698,301 as against $865,405 for the preceding fiscal year.

Minnesota & Ontario Paper Company—Net income for the March quarter was $343,422 as against $411,779 for the same quarter in 1942.

Paraffine Companies—Net profit for the March quarter was $326,903 as against $498,864 for the same quarter in 1942.

Scott Paper Company—Net income for the quarter ending April 2 was $405,464 as against $507,083 for the same quarter in 1942.

Union Bag & Paper Corporation—Net loss, after taxes and charges for the three months ended March 31 was $188,074 as compared with a net income of $619,204 in 1942.

U. S. Gypsum Company—Net profit for the March quarter was $1,048,343 as against $1,141,894 for the same quarter in 1942.

Westfield River Paper Company—Net profit in 1942 was $54,359, and in 1941, $13,795.

Worthy Paper Company Association—Net profit in 1942 was $17,557 as compared with $13,795 in 1941.

New York Stock Exchange—Stocks

	Closing Prices May 25, 1943	April 24, 1943
A. P. W. Paper Co.	*2½–2⅞	2½
Celotex	13½	13⅞
Same Preferred	*91¼–91½	90
Certain-teed	6⅞	6
Same Preferred	58	59
Champion P. & F. Co.	19¾	20
Same Preferred	*108–110	105
Container Corp.	22½	22⅜
Cont. Diamond	13⅞	14
Crown Zellerbach	14⅜	14½
Same Preferred	92¾	91½
Dixie Vortex	*14⅛–14½	13¾
Same "A"	41	39⅞
Robert Gair	3⅝	3⅞
Same Preferred	13⅝	14
Gaylord Container	14¼	14⅛
Same Preferred	51⅞	*53–53¼
International Paper	11⅞	11⅞
Same Preferred	56	58½
Kimberly Clark	*30¼–31⅞	29½
McAndrews & Forbes	*25⅞–26¼	27⅜
Masonite	38¾	33¾
Mead Corp.	9⅜	9¼
Same Preferred	82	83
Paraffine Cos.	42½	41½
Same Preferred	*105	*97–99
Rayonier	12⅜	13
Same Preferred	*29⅛–29½	29¼
Scott Paper	*42–42⅜	42
Same 4½% Pfd.	*111⅜–114	112
Same 4% Pfd.	110½	109
Union Bag & Paper	10⅞	10
U. S. Gypsum	70	69
Same Preferred	*180–185	181

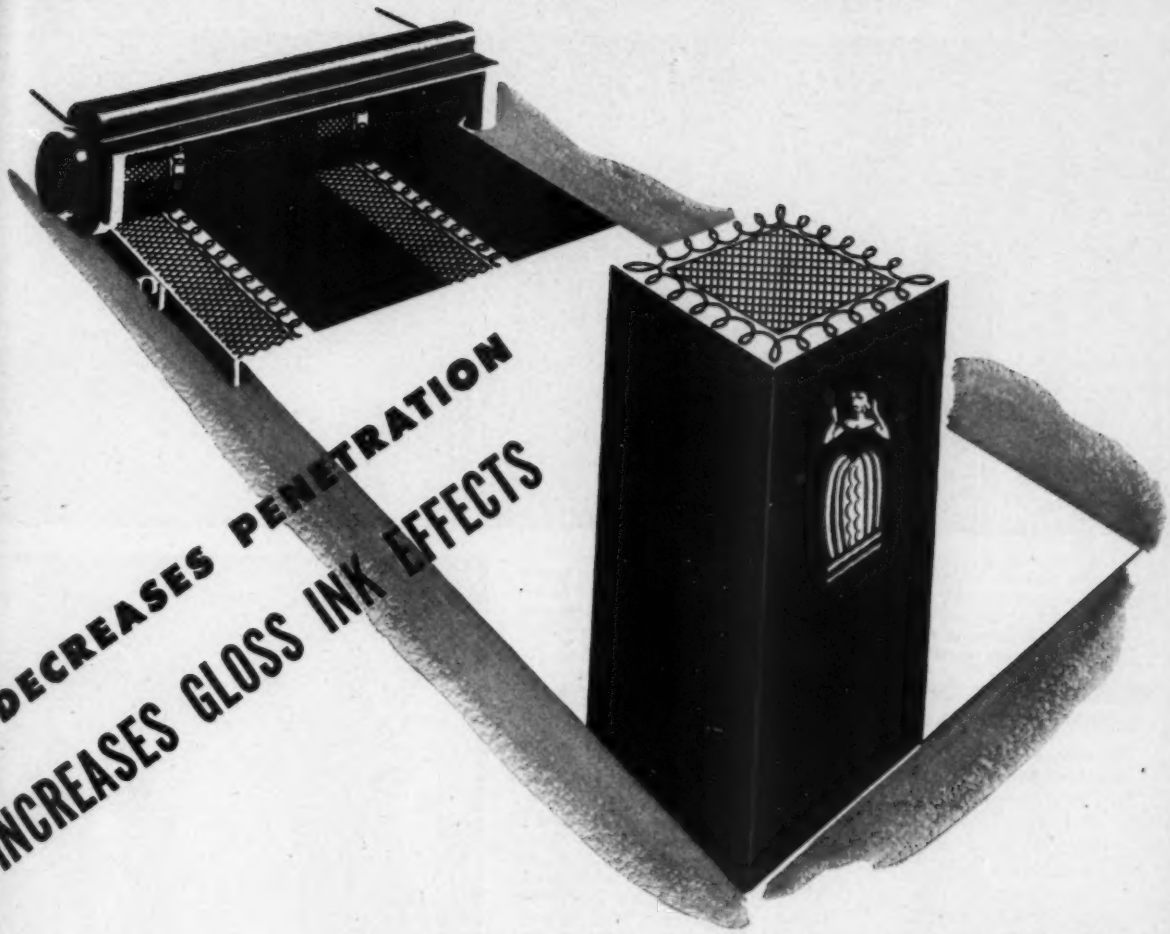
New York Stock Exchange—Bonds

Abitibi 5%	70	———
Celotex 4½%	102	101
Certain-teed 5½%	95⅞	———
Champion P. & F. Co. 4¾%	———	———
International Paper 5%	103¼	103¾
Same 6%	106½	106

New York Curb Exchange—Stocks

Am. Boxboard	———	7
Great Northern	32	33
Hummel Ross	———	5
St. Regis	3⅜	2⅜
Taggart	———	3⅞
United Wall Paper	2⅞	2⅞

*Closing Bid and Asked Prices.



METHOCEL
- Promotes Uniform Ink Receptivity
- Extends Ink Supplies
- Provides Grease Proofing for Paper

METHOCEL, the economical sizing material, permits outstanding gloss ink effects with regard to brightness and gloss of printing. It also aids in achieving an unusual degree of uniformity of ink receptivity—thus extending ink supplies through decreased penetration into the stock.

METHOCEL also effects valuable conservation of materials used in other paper and packaging operations. It reduces paraffin requirements and, being completely impervious to greases, fats, waxes and oils, does the work that often requires the use of one or more additional materials. These unusual qualities, plus exceptional film-forming properties, make METHOCEL a valuable and important "tool" to the paper industry.

THE DOW CHEMICAL COMPANY
MIDLAND, MICHIGAN

New York • St. Louis • Chicago • Houston
San Francisco • Los Angeles • Seattle

METHOCEL

THE UNIFORM SIZING MATERIAL

DOW
CHEMICALS INDISPENSABLE
TO INDUSTRY AND VICTORY

ABOVE (Left)—In the foreground is Harry F. Lewis, dean of the Institute, leading the Executives through the new addition to the Institute. Just behind Dean Lewis (wearing glasses) is F. J. Sensenbrenner, chairman of the board, Kimberly-Clark Corporation. (Right)—Harry H. Strauss (at right), president of Ecusta Paper Corporation, and Ward Harrison, asst. general superintendent of that company, inspect a Noble & Wood sheet machine.

MEMBERS OF INSTITUTE HOLD TWO-DAY SESSION

An unusually large number of executives attended the eighth annual Executives' Conference of the Institute of Paper Chemistry, Appleton, Wisconsin, held on May 20 and 21. This two-day session is the yearly inspection and review of the Institute, which is a model example of how a major industry and education can combine forces, and attracts executives of the member mills of the Institute which are scattered from coast to coast. The board of trustees met on the eve of the Conference.

The Conference opened on Thursday with registration and a visit

RIGHT—The large revolving carton tester attracted the attention of these five delegates to the Executives Conference at the Institute of Paper Chemistry. They are watching packed cartons getting thrown around in the drum. Left to Right: Harrison Larson of the Institute staff; C. M. Howells, plant manager, Scott Paper Company; R. F. Nelson, chairman Glassine and Greaseproof Manufacturers Association; H. T. Randall, vice president Champion Paper and Fibre Company; Colin Gardner III, Gardner Richardson Company, Middletown, Ohio; and Harold Murdock, research director of Champion Company.

LEFT—On an inspection tour during Executives Conference at the Institute. (L to R) Dr. Geo. Sears, of the Institute; Carl Magnus, Wausau Paper Mills; F. W. Brainerd, Scott Paper Company; Dr. B. L. Browning, of the Institute. RIGHT—Four paper industry leaders inspect new equipment in the new addition at the Institute during the Conference. (L to R) H. T. Randall, Champion Paper and Fibre Company; M. O. Schur, Brown Company; Harold Murdock, Champion Paper and Fibre Company; C. M. Howell, Scott Paper Company.

HOW LONG Should a Dryer Felt Last?

Because a Dryer Felt's cost is only a small fraction of the total cost of drying paper—many progressive mills today are saving money, not by "stretching the life" of old felts, but by replacing them as soon as their drying efficiency begins to fall off. One plant reports a material saving in steam cost alone, when they removed an old felt with glazed-over and clogged weave preventing free elimination of moisture.

The new Felt used was the HOOPERWOOD Style 218—an extra-porous, light-weight Cotton Felt with smooth surface for fine finish and with the same working strength as heavy felts.

The lower first cost of this felt means they don't have to stretch its life beyond its efficient usefulness to get their money back, while its better moisture elimination pays them dividends in steam economy every day it runs.

If your present dryer felts are costing too much per ton of production, we will be glad to discuss the problem with you and help you choose the particular HOOPERWOOD Felt to best meet your operating conditions.

WM. E. HOOPER & SONS COMPANY

PHILADELPHIA, PENNSYLVANIA

Since 1800

HOOPERWOOD DRYER FELTS

through the Institute buildings, the fourth major addition since the Institute was founded in 1929 having been constructed during the past year. At the noon luncheon of the first day, Westbrook Steele, executive director, gave his annual report. The speaker at the banquet Thursday evening was the Honorable Joseph Clark Grew, special assistant to the Secretary, Department of State, and former ambassador to Japan.

Student discourses and staff discussions were held Friday morning and following the luncheon, at which the main speaker was Dr. G. A. Borgese, professor of Italian languages at the University of Chicago. A golf tournament was held at the North Shore Golf Club both afternoons.

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DEGREES AWARDED 20 INSTITUTE GRADUATES

One hundred thirty graduates were granted degrees by Lawrence College, Appleton, Wisconsin, at the 93rd annual commencement exercises on May 30. Twenty of the degrees were awarded to students of the Institute of Paper Chemistry, a graduate school affiliated with Lawrence offering the finest technical training in the paper industry. Of the 20, 13 received the Ph. D. degree. Their names and titles of their theses are as follows:

Daniel O. Adams, Portland, Me., "A Study of Some Factors Influencing the Dielectric Strength of Paper."

Cyril Delevanti, Jr., Hollywood, Cal., "The Development of Apparatus and Techniques for the Study of the Dielectric Constant and Loss Angle of Paper."

Archie J. Deutschman, Jr., Chicago, "Electrical Resistance of Paper."

Pasquale A. Forni, Lee, Mass., "The Effect of Bleaching on the Optical Characteristics of Pulp."

Paul B. Hansen, Yakima, Wash., "A Study of the Power Factor and Specific Inductive Capacity of a Paper Dielectric as Influenced by Certain Constituents of the Paper."

James J. Harrison, Conrad, Mont., "The Investigation of the Physical Strength Properties, the Hygroscopicity, and the Hygroexpansivity of Handsheets Prepared from Esterified Pulp Fibers."

Edwin J. Loutzenheiser, Jr., Gothenburg, Neb., "Study of Technical Possibilities of Vulcanized Oil Compositions."

Keith W. Max, Lewisburg, O., "A Study of Tall Oil from Green and Seasoned Slash Pine Wood."

Jules J. Perot, Jr., Shreveport, La., "A Study of Certain Factors Affecting the Filtration of Smoke by Fibrous Materials."

Frederick B. Schelhorn, Glenside, Pa., "A Study of Chemical Recovery in the Monosulphite Pulping Process."

Philip E. Shick, Van Wert, O., "A Study of the Mechanism of Film Formation in the Spray-Coating of Paper with Nitrocellulose Lacquers."

John G. Turk, Hillsboro, Texas, "Study of the Factors Influencing the Degradation of Wool Fiber."

Robert J. Van Nostrand, Wauwatosa, Wis., "The Behavior of Cellulose in Various Atmospheres after Exposure to Ultraviolet Light."

The following student graduates received an M. S. degree: Joseph C. Clark, Jr., Columbia, South Carolina; John Lawrence Gray, Phenix City, Alabama; Arthur John Haug, Wauwatosa, Wisconsin; Gary Wood Jones, White Plains, New York; Robert Eugene March, Jefferson, Ohio; George Edward Martin, Houston, Texas, and Curtis Sanborn Walseth, Clear Lake, South Dakota.

Lawrence College will reopen for its 96th year on June 29 with new student week. Classes will begin on July 5, and the college will then be on an around the calendar basis, with three full semesters each year.

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CAN. TARGET PAPER NOT ADMITTED AS PRINTING PAPER

Customs officials have decided that Canadian target paper is dutiable as paper not specially provided for at 30 per cent, and is not admissible as printing paper at 1/5 cent per pound and 5 per cent. The officials found upon investigation that such paper must be made to strict specifications, especially of such fiber content that when perforated by bullets, the holes will be clean-cut and not rough tears. The prospective importer may try to have the paper admitted duty free as military supplies, though the paper is to be imported, if at all, in roll form and then be printed by commercial establishments on Government order.

A long pending protest by a Chicago importer against the classification of colored sheets of newsprint as dutiable printing paper, claiming the paper to be duty free standard newsprint, has been called for trial in Chicago, but the importer asked a postponement of the case when the date of trial arrived. It is reported that the protest may be abandoned, in view of the fact that long investigation by Government authorities showed that paper, though in newsprint tints, was not chiefly used for newspaper publication when in sheet form. In the case in question, it was apparent that the eventual purpose of the shipment was for use as second sheets, the paper being in sheets which are multiples of typewriter sizes. Duty was collected at the rate for printing paper. If the case is eventually tried, the Import Committee will provide the Government with testimony that colored news in sheets is almost never used for newspaper publication.

◆

GREAT LAKES AREA TO GET INSUFFICIENT PULPWOOD FROM CAN.

Paper and pulp mills in northern New York face a serious problem because of the lack of adequate freighters on the St. Lawrence River and Great Lakes to carry Canadian pulpwood by water during the summer and fall months.

Where normally there would be 133 freighters plying between Cape Vincent, Clayton, Ogdensburg, and Gulf of St. Lawrence ports, there will be only 73 this year. The decrease results from the fact that so many have been sunk by German U-boats, transferred to South America to transport bauxite, or to other places for necessary war shipments. Consequently, there will be no pulpwood brought into the port of Cape Vincent at all this season by the Cape Terminals, Inc., to supply north country mills. However, there will be some wood pulp from the north shore of the Gulf of St. Lawrence coming into the Hall terminal at Clayton this summer, brought up the river in small schooners and transshipped by rail from Clayton to the Scott Paper Company, Chester, Pennsylvania.

The St. Regis Paper Company, New York City, expects to receive about 25,000 cords of Canadian pulpwood by water transportation through the port of Waddington this summer. However, the 25,000 cords will be but a fraction of the year's needs of the mills of St. Regis and some of its subsidiaries.

◆

IMPORT RULINGS

Three shipments of air mail letter paper from England, in sheets 17 x 22 inches, have been classified for duty as tissue paper at 5 cents per pound and 15 per cent, inasmuch as the paper weighs only 8 pounds per ream, under the Tariff Act. The writing paper rate is 3 cents per pound and 15 per cent, but admission at this rate was denied by Customs officials, according to Warren B. Bullock, manager of the Import Committee of the American Paper Industry. The importers have carried this issue to the United States Customs Court, and are also protesting against the inclusion of the British Purchase Tax in the dutiable value.

OUT OF THESE FLOCS MAY COME THE FUTURE OF THE WORLD

These white crumbs or "flocs" look very unimportant in themselves . . . but on them may depend the future of the world. They are one of the first stages in the production of synthetic rubber, the most vital material being produced in America today.

Naturally, you are interested in synthetic rubber. But synthetic rubber is only incidental. What is really important is what happens to synthetic rubber after it is actually produced. It is chemistry that makes rubber fit to use, suits it to the task at hand.

United States Rubber Company is the largest manufacturer of rubber chemicals in the world. We have worked with rubber, improved it and broadened its uses for 100 years. Today, all this tremendous fund of knowledge of the chemistry of rubber is being drawn upon to improve synthetic rubber, perfect it for the jobs it must do for the Armed Forces and war industry.

The chemistry of rubber is what determines the final compounding and processing of the flocs of synthetic rubber you see here. They may eventually go into bullet-sealing hose, air ducts, or any one of a score of other parts used in the plane that will blast the last Nip carrier off the sea. They may be made into a tire that will rumble down bomb-battered Unter den Linden. They may go into some essential equipment like a conveyor belt that will keep America's war production line moving at top speed. They might very easily determine the entire course of the war, and thereby the future of the world.

Synthetic rubber, its production, compounding and application to war and industrial uses, is too big a story to present adequately here. There are five basic commercial types of synthetic rubber. Each of them has distinct properties and characteristics. Not a single one is ideal for all purposes.

Deciding which synthetic rubber to select and use for a particular task is an equally big story, a decision that requires expert knowledge and broad range experience.

We have told the story of the five basic commercial types of synthetic rubber, our more than twenty years of experience in working with them, and our twelve years of using synthetic rubber commercially in an interesting, informative booklet for business executives. Please ask for your copy on your regular business letterhead.

UNITED STATES RUBBER COMPANY

1230 SIXTH AVENUE, ROCKEFELLER CENTER, NEW YORK

In Canada: Dominion Rubber Co., Ltd.

The United States Customs Court has ruled against a Jacksonville importer in a case involving the duty on a series of shipments of sulphite bag paper. There were 10 separate court cases involved in the decision, consisting of 24 separate shipments, totaling over 1,000,000 pounds. The cases have been in the courts since 1939.

The Customs officials have ruled that Canadian bottle cap board, imported at a price based upon the Canadian f.o.b. mill price less freight, is dutiable at the Canadian home market value, the deduction of freight being disallowed. The officials have also decided against the claim of the importer that inasmuch as such board contains no sizing, it is duty free as pulp.

◆

STATE OF GEORGIA CONTINUES SUPPORT OF HERTY FOUNDATION

Georgia is continuing its state financial support for the Herty Foundation Laboratory at Savannah, (cf. THE PAPER INDUSTRY AND PAPER WORLD, December, 1942, p. 909) and its Woodland division, according to an announcement by the Foundation and representatives of Georgia timber growers on May 13.

The announcement stated that Governor Ellis Arnall had agreed to provide the laboratory with $10,000 annually, and the Woodland division with $6,000. The latter is a marketing agency set up to assist timber growers in marketing, while the laboratory carries on research to develop new uses for their product.

The Woodland division was credited with furnishing growers with information that recently led to the OPA grant of a 20 cent per cord increase in the ceiling price of timber for pulpwood. The higher price became effective May 4 in Georgia, Florida, and South Carolina.

◆

BOY SCOUTS WILL CONDUCT VACATION SALVAGE CAMPAIGN

Boy Scouts of America and their junior Cubs will participate in a nation-wide scrap scouting campaign as soon as schools close for the summer vacation.

Members of every Boy Scout troop and Cub pack are being prepared for this national campaign—the first such of their organization—through study of a special booklet from James E. West, chief Scout executive. The 42,833 Scout troops and 8,566 Cub packs, totalling 1,205,119 boys, will work closely with many of the more than 11,000 Salvage Committees established throughout the nation in co-operation with the WPB.

Scouts already participated in community scrap-gatherings, but the new campaign is planned to discover iron and steel rusting unnoticed in the great American outdoors. The special aim will be the discovery of heavy scrap which can be reported and later brought in by tractor, truck, or wagon.

◆

REPORT THAT WESTON AND ASSOCIATES WILL CONTROL MORE MILLS

Ottawa, Ontario, and Hull, Quebec, are on the verge of the most gigantic industrial developments of the generation in that district, with the Canadian-born member of Parliament in England, W. Garfield Weston and his associates on the point of assuming complete control of the district's pulp and paper industries.

It has been reported that Mr. Weston is negotiating to purchase the Chaudiere mills of the J. R. Booth Company, Ltd., and completion of the deal is expected shortly. The timber rights of the Booth Company are said not to be part of the deal and would remain the property of the company.

Mr. Weston had purchased the E. B. Eddy Company from Viscount Bennett earlier this spring, and the move to procure the Booth interests is understood to be directed toward the formation of a gigantic concern for the manufacture of plastics on a scale unprecedented in Canada. A drastic reorganization and modernization of the two large plants is forecast, and the possibilities of postwar employment in Ottawa and the district are regarded as most encouraging.

◆

PULP FROM LOG WASTE WILL BE TESTED BY POWELL RIVER CO.

An experiment testing the utilization of small growth and debris of logging operations will be undertaken by the Powell River Company, Powell River, British Columbia, and the Comox Logging & Railroad Company, as a result of an agreement entered into with the British Columbia Government.

The Comox company will undertake the salvaging of logging waste and Powell River will test its suitability for pulp making. If the experiment proves successful, the beneficial effects will be far reaching, making smaller growth and debris of logged-over areas available for pulp and paper production, and many small holdings, not at present economically regarded as justifying logging, could be made to give returns.

WALLOOMSAC MILL WILL RESUME WORK SHORTLY

Operations at the Walloomsac mill, Walloomsac, New York, are definitely expected to be resumed shortly. Although many details are yet to be developed, workmen are already engaged in conditioning the machinery, and it was stated authoritatively that the mill will soon be in operation.

Nothing official has been learned, but it is believed the plant will operate under the name of Walloomsac Paper Mills, and will have no connection with the former owner, the Windsor Paper Mills Company, or any of its affiliated concerns. The reopening will probably be confined to one of the two large machines in the plant, and employ up to 50 men.

◆

PAPER SHORTAGE IS FELT IN OCCUPIED COUNTRIES & AFRICA

According to the *Foreign Commerce Weekly*, some of the occupied countries as well as South Africa are feeling a shortage of paper.

Newsprint has been rationed in Denmark since August 1, 1942, because of that country's dependence upon imports for most of this type of paper. The 15 per cent reduction in volume of daily newspapers (and an 8-page reduction of weekly periodicals) now in effect is feared to be a forerunner of more drastic curtailments.

Increasing shortage of paper and cellulose is being felt in Norway. This is caused mostly by a lack of coal and unusual demands on the transportation system. Former paper stocks have become depleted to such an extent that a far-reaching rationing of newsprint has been decreed. About 80 newspapers and magazines have had to cease publication.

Editors of the morning edition of the largest Norwegian daily in Oslo have been forced to announce that no new subscriptions could be accepted.

Newspapers and magazines are restricted to considerably less than 50 per cent of their former paper consumption. New newspapers and other periodicals may be published only with authorization of the Department of Public Education. This situation has prevailed since the beginning of 1942.

Most South African daily newspapers have been reduced to 30 per cent of their pre-war size, and week-end papers to 25 per cent. Magazines and periodicals are now only half their 1939 size, according to an African publication.

TANKS BY AMERICAN LOCOMOTIVE COMPANY

Whether forward into battle, or meeting the terrific punishment of tough terrain, our tanks must withstand the impact of shock and strain. Such rigorous service requirements demand rigid quality-control in manufacture. And Jones' experience and facilities for building rugged paper machinery was called upon for producing tank turrets that would stand the gaff of war. We're "all-out" building other war equipment, too, to help our armed forces speed on to victory.

Jones

GEARED FOR WAR PRODUCTION

E.D. JONES & SONS COMPANY - PITTSFIELD, MASS.

Builders of Quality Machinery for Paper Mills

Briefs . . .

▶▶▶ A GAS PRODUCER is to be installed in one of the departmental patrol boats, the *Ranger IV*, of the Ontario (Canada) Department of Lands and Forests if necessary materials can be obtained by a company in Sarnia which is making the "B.V.P." producer. It is to weigh 600 pounds, complete with fuel for approximately 5 hours' running. Charcoal will be used, and the producer as supplied can be converted to sawdust.

◆

▶▶▶ EXCHANGE OF TIMBER LIMITS in North Gaspe, held by the Brown Corporation of La Tuque (Quebec), for some Crown lands in the Saguenay area is provided for by a bill adopted at Quebec.

◆

▶▶▶ A STANDING TECHNICAL COMMITTEE has been formed to keep the Department of Lands and Forests for Ontario in touch with improved techniques, new equipment, or progress made in any technical field in which the Department is interested. The committee, composed of R. N. Johnston, chairman, F. W. Weaver, and F. E. Grainger, will report to the deputy minister, F. A. MacDougall, on July 1 and January 1 of each year on any new developments, and divisional chiefs and regional foresters will keep the committee advised of such developments.

◆

▶▶▶ ANOTHER EMPLOYEE passed away as the result of injuries suffered in the boiler explosion at the Albemarle Paper Company, Richmond, Virginia, on April 20, bringing the total fatalities up to 9. (Cf. THE PAPER INDUSTRY AND PAPER WORLD, Page 122, May, 1943.)

◆

▶▶▶ R. J. CULLEN, president of International Paper Company, announced at the annual meeting held in New York on May 12 that directors of the company will declare dividends on the common stock when they feel that "the financial position of the company and general conditions warrant it." Discussing the 1943 outlook, Mr. Cullen stated that continuance of the Office of Price Administration's policy of refusing to increase the company's selling price would inevitably reduce the returns to stockholders and likewise the amount of taxes paid to the Government.

▶▶▶ PAYMENT TO BONDHOLDERS OF the Abitibi Power and Paper Company, Ltd., Toronto, will be made on capital account in Canadian funds of $190 for each $1,000 in bonds, as a result of an order issued on May 19 by Justice R. L. Kellock of the Ontario Supreme Court. The order was made following hearing of an application by the Montreal Trust Company, trustee under the bond mortgage. Abitibi has been in receivership since 1932.

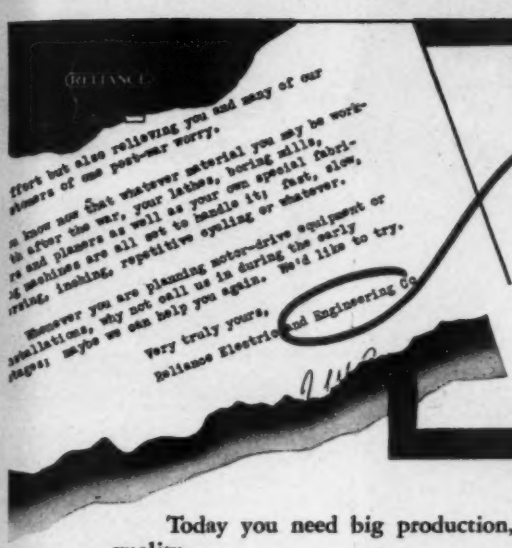
◆

▶▶▶ WOMEN'S INCREASING IMPORTANCE in industry is further evidenced by a recent report from the personnel office of the Crown Willamette Paper Company, Camas, Washington. Records of the company show that 101 women are now engaged in work that has always been done exclusively by men, putting in a total working time of 749 hours per day.

◆

▶▶▶ TRANSFER OF NEWFOUNDLAND LOGGERS to areas in Canada suffering from a shortage of such help is the subject of consultations being carried on with the commissioners of the Newfoundland Government through the External Affairs Department, according to Canada's Selective Service Director Arthur MacNamara.

SCALING....
Certain furnishes or water conditions may cause a scale to be deposited on the wire. When this scale forms it not only results in a decrease of drainage efficiency, but it may also shorten the life of the wire by increasing erosion.
The photomicrograph above illustrates a case of excessive scaling. As the scale flakes off it takes with it minute pieces of metal in a process of erosion that weakens the cloth.
This is the fifth of a series on factors contributing to wire life.
Appleton Wire Works, Inc. Appleton, Wis.


RELIANCE
ffort but also relieving you and many of our
stomers of one post-war worry.
n know now that whatever material you may be work-
th after the war, your lathes, boring mills,
rs and planers as well as your own special fabri-
g machines are all set to handle it; fast, slow,
rving, inching, repetitive cycling or whatever.
Whenever you are planning motor-drive equipment or
nstallations, why not call us in during the early
tages; maybe we can help you again. We'd like to try.
Very truly yours,
Reliance Electric and Engineering Co.

These two words make motor-drive more than power!

Today you need big production, high quality.

Tomorrow? The same requirements, probably; but with new methods and processes.

Fortunately, in your motor-driven equipment you can meet today's needs and, at the same time, be preparing for tomorrow's unknown demands. It takes good motors AND ENGINEERING.

Adapted to your needs, Reliance motor-drive can do *many things* for you.

If you design or use motor-driven machines or equipment, you need to get the right answer to this question: *"What can we make a motor do besides supply power?"*

Reliance Application Engineers—production-minded men with wide experience in providing flexible power and control through the use of motor-drive—can help you get the answer.

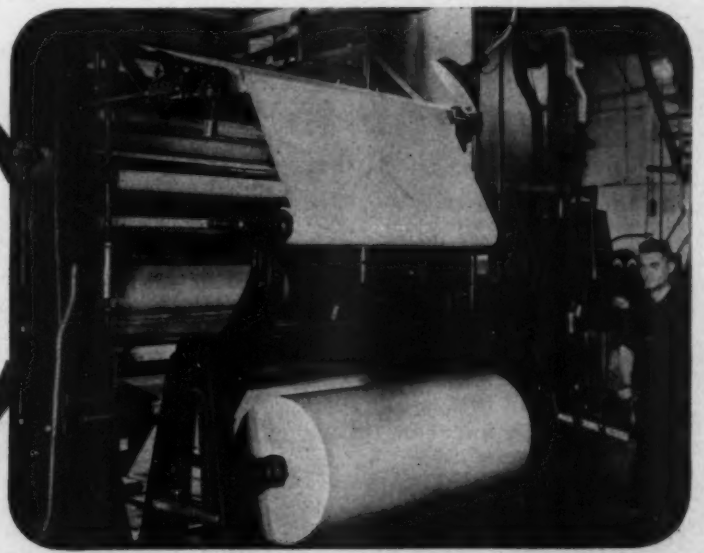
You will like the way they work. Just phone or write to our nearest office.

Motor-drive provides within itself a means of:

Speed Control	Reversing
Braking	Remote Control
Tandem Operation	Controlled Acceleration
Tension Control	Safety

Slow Speeds for Inching, threading, inspection

Applying them to boost production and improve quality is APPLICATION ENGINEERING. That's our business.



Reliance Supercalender Drives provide the flexibility of power control so essential to maximum production of uniformly good quality paper: 120 (or more) operating speeds to suit material and operating conditions from threading through warm-up to a full calendering range; fast, but smooth, acceleration and deceleration save time and give protection to material and equipment on slow-downs for "flags" and stops for breaks; direct drive with centralized control means convenience, space-saving, fewer parts and lower maintenance.

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RELIANCE A-C D-C MOTORS

ING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUBRICATION ENGINEERING...LUB

Gear wear and what you can do to reduce it

GEAR WEAR is described by many terms—pitting, spalling, scoring, galling, scuffing—but by any name it all adds up to high maintenance, lost machine time, and replacement headaches.

Today, much of your power transmission equipment is operating at full-load—if not overloaded. That means, first, that more frequent inspections are needed, particularly on enclosed gears and bearings, to detect wear before serious damage is done.

Second, these new operating conditions may require more frequent lubricating schedules or even new types of lubricants. It's a good time to check these points thoroughly before they show up in excessive wear.

Signs of gear wear, and the cause, are easily recognized in many instances. A few are pictured and described at the right. But determining the cure is not always simple.

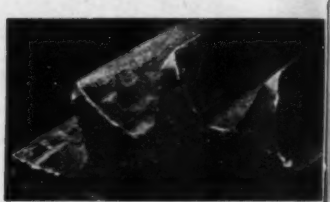
Why not do the whole job at once—check equipment for excessive wear, check lubricating schedules and lubricants—by having a Standard Lubrication Engineer help you make an inspection of this equipment. He has done this in other plants and has made many valuable suggestions. It will take very little of your time and will cost you nothing. Call any local Standard Oil Company (Indiana) office, or write 910 South Michigan Avenue, Chicago, Illinois, for the Engineer nearest you. In Nebraska, call any Standard Oil Company of Nebraska office.

OIL IS AMMUNITION . . . USE IT WISELY

Typical examples of gear wear

Pitting is of two types: (1) Corrective pitting—occurs when gears are first operated, caused by high spots in gear finish. When high spots are eliminated pitting stops. (2) Destructive pitting, illustrated above—occurs when pitting continues until the contacting surfaces are destroyed.

Watch for signs of pitting on new gears. Prevent it from reaching the destructive stage by truing up contact surfaces and applying more effective lubricant.



Abrasion: Generally distinguished by radial scratches on the teeth. In enclosed gears, use greater care in handling lubricants and filling gear cases to prevent entrance of grit and dust. On open gears in dusty conditions, use non-sticky gear compound to reduce abrasion.

Scoring and galling: Different degrees of the same type of wear. Scoring is scratching, grooving, or roughening of tooth surface. Galling, shown above, is seizing or tearing of the surface as the result of continued scoring. Causes: Excessive pressures, rough surfaces, foreign matter, or inadequate lubrication. Analyze any scoring, and correct it before galling occurs.

These are but a few examples. A Standard Lubrication Engineer can help you determine the cause of many types of gear failure and suggest ways to prevent them.

STANDARD OIL COMPANY (INDIANA) STANDARD SERVICE

. . . . . Editorial . . . . . .

Serious Shortage of Pulp

▶▶▶ THE IMMEDIATE OUTSTANDING PROBLEMS of the paper industry are the menace of further curtailments of operation, shutdowns, and liquidations.

The pulpwood shortage is an acute headache. This shortage stems from the large number of men who were taken from the forests and fields of the country during 1942 by the Selective Service and the War Manpower Commission. These men will not be back on the farms and in the forests until the War is over.

In the face of this increasing shortage of pulpwood and other raw material supplies, the demand for greater tonnages of paper products from all of the major production divisions—particularly the largest producers like kraft paper and packages—increases as the War activities expand. The question as to which mills should operate from now on depends upon how much pulp is available. In answer to this, the Allocation Committee of the War Production Board gives the green light by making adequate allotments of pulp.

And, right here, a very important problem bobs up: What basis shall the Allocation Committee of the War Production Board use in making the monthly allotments of pulp?

There are two bases: (1) allotting the pulp upon a horizontal basis, or (2) upon the basis of essential end uses. Up to this time, neither plan is being used because there has been sufficient pulp available to justify allotting each mill its requested quota. However, when the Allocation Committee of the War Production Board met to make the allotments for the month of June, a heavy shortage of pulp was disclosed, so that emergency allotments were required. That resulted in an order requiring each mill to withhold 20 per cent of its pulp products for emergency allocation by the WPB.

In view of the fact that the pulp-producing mills are operating under the restriction of 85 per cent of capacity, the additional withholding order of 20 per cent takes a total of 35 per cent of the pulp capacity of the mills out from under their control.

This situation calls for the adoption by the WPB of a fair and just plan of allotment. It is possible that the Pulp and Paper Division of the WPB hesitates, on its own initiative, to promulgate such a plan. It apparently would prefer (and rightly so, it would seem to us) that it come as a demand from the Paper Industry Advisory Committee.

There is no doubt, but that the War Production Board is rapidly being convinced of the essentiality of paper products to the winning of the War. Therefore, it would seem to be most advisable that the Paper Industry Advisory Committee get behind and strongly recommend to the WPB whichever plan seems to meet the best needs of the industry as a whole.

Problems and Responsibilities

▶▶▶ "IT NEVER RAINS BUT IT POURS," is a trite old saying that might well apply to the pulp and paper industry in today's industrial picture. On the one hand are problems relating to production; on the other, responsibilities in the war effort.

Only recently, the War Manpower Commission declared the essentiality of all kinds of pulp, 28 types of paper and paperboard, and an extensive list of converted items made from paper and paperboard. This move is a step in the right direction; but it is hoped that soon the Commission will see fit to declare essentiality of the pulp and paper industry in its entirety.

Whether it does or not, the wartime responsibilities of the industry will not be lessened; in fact, they will increase.

The demands of the Armed Forces for the development of new types of paper and paperboard to meet the needs of their packaging requirements have been and are being met in a way that is little short of miraculous. Almost daily comes an announcement covering the development of some new paper or paperboard, or of some new converted product that has been conceived and successfully produced because of a wartime need.

The industry has been no laggard. On the contrary, it has accepted the challenge of "See what you can do!" and in many cases has succeeded in satisfying most exacting requirements. In other cases, it has made marked progress and is continuing its efforts to the end that satisfactory products will be forthcoming. All of these developments have come about with the industry meeting its large and necessary civilian requirements as well.

It has required leadership of the highest order to shoulder these responsibilities in the face of increasingly acute production problems involving shortage in pulpwood supply, a diminished wastepaper supply, transportation difficulties, and manpower shortage.

The accomplishments of the industry in the face of such obstacles are proof of its virility and stamina. If the problems of production are removed, or even lessened, the industry can be expected to do the unexpected in the further development of its products.

◆

World Peace

▶▶▶ IN A RECENT ADDRESS before the American Society of Refrigeration Engineers, James F. Lincoln, president of the Lincoln Electric Company, said, "If we win this War and continue to suppress the rights of the individual to develop his latent ability, we will have lost everything that any free individual can fight for regardless of the military outcome." "Democracy," he said, "has succeeded because it allows the worker to produce his maximum and contribute benefits to himself and to mankind that he never thought were within his power."

"It isn't beyond the realm of possibility," continued Mr. Lincoln, "that the individual, given the proper incentive, will be able to progress to so great an extent that he will be able to bring about benefits beyond belief within the next generation. To reach such objectives," he concluded, "government must be made for man, not man for government."

Current Thought . . . . WILLIAM SIBLEY

x + Multiplication is Addition

÷ − Division is Subtraction

▶▶▶ THERE IS A DEFINITE TREND throughout the democratic nations of the globe which may be defined as a world-wide movement away from the blessings accruing to men through "opportunity" and toward an illusory and short-lived "security." Many peoples are today giving evidence of wishing to trade a mass of enterprise for a mess of pottage. What most of them seemingly fail to recognize is the simple fact that enterprise lasts a lifetime; pottage lasts a meal.

Now, this and other nations are fighting a cruel war for freedom. At its end, it is clear that the common people will never again be content with the kind of economic freedom that provides insecurity of the job and brings periods of distressing unemployment; a freedom which affords special privileges for the few and permits only part-time use of our vast productive machine. However, they will value more than ever the resultant freedoms which have always been the concomitant of our form of government and a part of our everyday life in times of peace.

At this point it should be noted that never in recorded history has a "planned economy" worked to the satisfaction of anyone save the few who are in control. (And, most frequently, not even to them—since the system they control has never worked.) The planned economy of the Roman emperors—the planned economy of Germany—the planned economy of Italy—the planned economy of Spain—have led those nations into disaster. Only the doubtful virtue of war made Russia momentarily recognize individual merit and individual enterprise and saved that nation from the same disaster of planned economy.

Right now—England is flirting with a postwar social economy far different from what was formerly hers. So are we, as Americans, flirting with a similar change. So are the Australians. So are several of the South American countries. . . . And therein lies large discouragement. Because, as may plainly be seen throughout both history and current events, "planned economy" doesn't work. Why? Because in all these nations, and in all these instances, stress is put upon security for all; little being said or done about the enlargement of opportunity for the individual's performance or record.

Look: Daniel Boone wasn't thinking about "social security" when he invaded Kentucky through the Cumberland Gap. . . . Sam Houston wasn't thinking about a "planned economy" when he went into what was later known as Texas; Kit Carson wasn't thinking about "social security" when he led Fremont's army into California; Wild-Bill Hickok wasn't thinking of "planned economy" when he accepted the post of marshall of Dodge City. . . . Nor did "Jim" Hill think of "planned economy" when he turned raw prairie into golden grain by an injection of steel rails; that young Scottish kid, Andy Carnegie, wasn't mouthing "freedom from fear" when he made steel into literacy for a nation through libraries; nor was J. D. Rockefeller thinking of "planned economy" when he assigned his black-gold to the Foundation which has lifted the standard of health the world over. . . . Nor do Private Bill Guggenslocker and Seaman Tom Jones think of "social security" when they endure the hardships of Iceland, Tasmania, the South Pacific or Europe.

No! none were thinking of "social security" or a "planned economy" because "social security" and private enterprise or a "planned economy" and the profit-system are as incompatible as oil and water. They are diametrically opposed ideologies. They do not, cannot live side by side. It is impossible to have individual freedom and "social security."

For almost a decade this country has been treated to a procession of social-economic philosophers who base their theories on the assumption that Americans are not capable of planning and working out their own destinies. (They seem to overlook the fact that thus far we have done pretty well. They fail to see that our early form of Government has made possible the development of the highest standard of living known to man and this in spite of recurring panics, depressions, and booms.) They want us to change the rules of the game if we are to achieve what *they* define as a more abundant life blessed by freedom from fear.

The War, and especially Pearl Harbor, brought us up short, and we have achieved miracles in producing and transporting war materials, and in converting peaceful men into "fighting fools." Even the wildest of recent planners now seems to appreciate the value of incentives inherent in a system of free enterprise that has accomplished in little more than 14 months what the Axis built in something like 14 years.

The time has come to plan for opportunity, not security; for multiplication of the material and spiritual blessings of this world, not just a dividing up of what is immediately available. To subtract from one man or one group or one nation, to give to another, does not add one iota to the sum total of world wealth; to divide up what we have means merely to weaken the strong and so lower the standards for all.

The time has come to fight this War through to a hard-driving and completely victorious close. The time is close when we of the United States must call a halt to drifting and dreaming. We must insist on continuing along the proven paths of multiplication and addition, not division which results in subtraction; toward dynamic opportunity, not wishful security.

"Bugs"

With everyone clamoring for steel, it's most disheartening to learn that a lowly sulphate reducing bacteria is consuming large quantities of industrial water cooling pipe.

It was hard for us to believe, too, but bacteriologists proved it to our satisfaction when they took sample water pipes and photomagnified one of these little "sulphur bugs" by fifty thousand diameters.

If you are having trouble with some "unexplainable corrosion" watch for:

1. Free sulphur or sulphides on pipe sample even though water shows no signs of these.
2. Odor of H_2S in the exhaust cooling water.
3. H_2S when HCl is added to a sample of the corroded metal.
4. Progressively worse corrosion as you proceed farther from the inlet end.
5. Acceleration of corrosion rate.

These "bugs" are especially prevalent where water is taken from a well or stagnant pond. Chlorinate the water and you will kill the "bugs" and save many tons of badly needed steel. The Timken Roller Bearing Company, Canton, Ohio. Steel and Tube Division.

TIMKEN

TRADE-MARK REG. U. S. PAT. OFF.

ALLOY STEELS

Samples of pipe attacked by "sulphur bugs".

No, the photographer hasn't photographed his thumb. This is the portrait of a "sulphur bug" magnified 50,000 diameters.

EMERGENCY LANDING — Protected by Paper

Supplies for a distant fighting force—on a South Pacific Island, on a North African Coast. No docks to use. No time to lose. Into the surf they must go—thousands of cases of food, clothing, munitions. Hours and days must pass before they can be collected. And the contents must be protected.

That urgent problem was solved by the paper industry—with sturdy water-proof packing that withstands the ravages of the sea, the crushing impact of the breakers and the shore.

Millions of tons of paper are protecting such shipments safely to their destination, releasing lumber and metal for critical needs, saving weight and precious shipping space.

Thus has the essential paper industry made another major contribution to the service of supply, to the winning of the war.

KENWOOD WOOL PRODUCTS

F. C. Huyck & Sons is proud to be serving an industry so essential to the war program. Our skill, our facilities and our 72 years of experience are always available in solving the special felt problems created by urgent wartime paper needs.

F. C. HUYCK & SONS

Kenwood Mills

Albany New York

For their sake

The trend of modern machinery design is towards greater use of built-in rolled shell shaftless type electric motors.

Direct motor drive of different operating parts of a machine permits the application of motors with exactly the proper electrical characteristics for each drive. This eliminates costly and complicated mechanical transmission of power from one part of the machine to another.

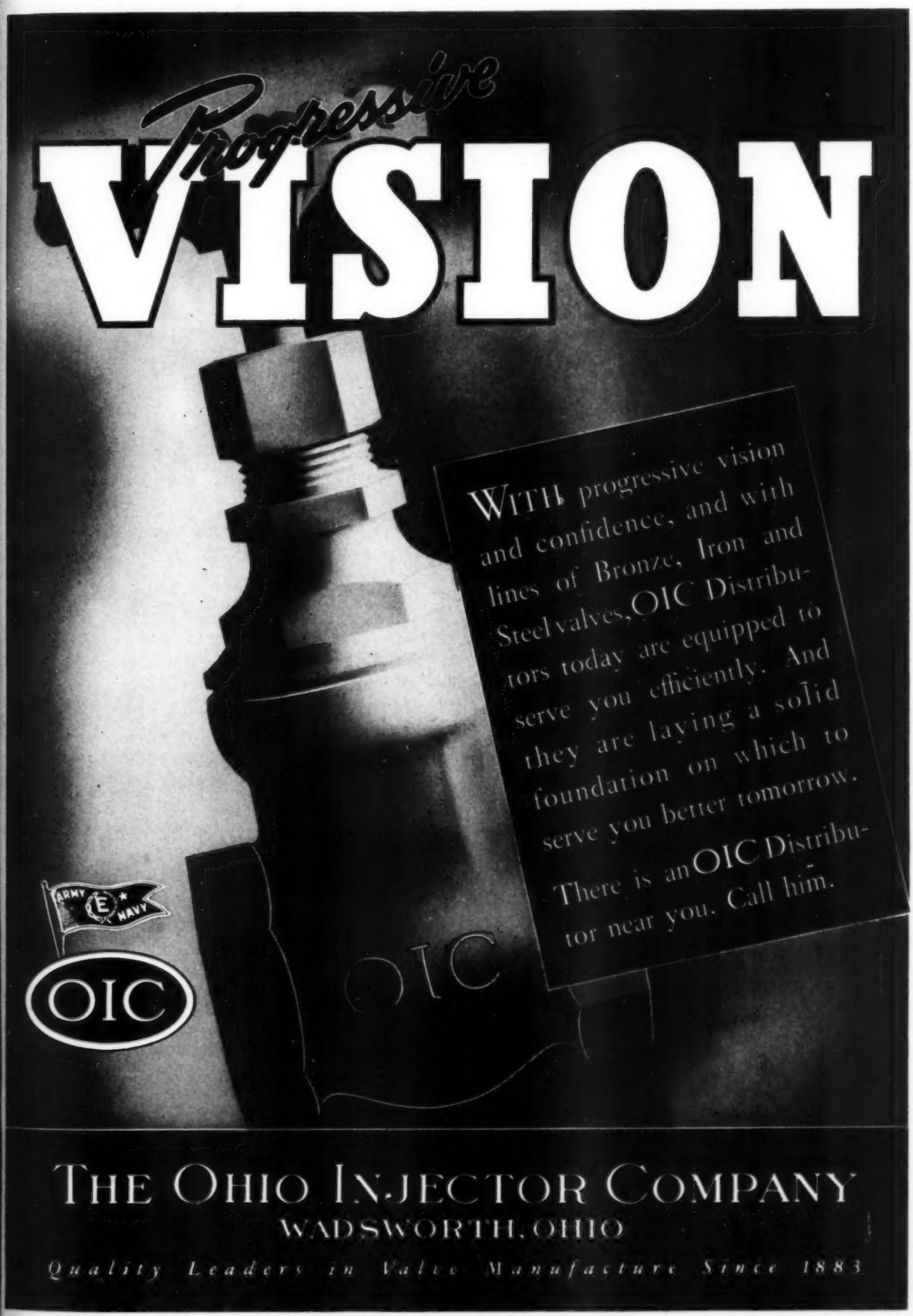
A wide range of electrical characteristics and dimensions for each horsepower rating—permits a greater flexibility in designing machinery.

For over 40 years we have been working hand in hand with machinery designers—helping to make good machinery better—by the proper application of the proper motors.

We earnestly solicit your inquiry on your very next electric motor requirement—and assure you that your needs will receive our most prompt and careful attention in every way.

A copy of our Bulletin No. 516C, describing shaftless motors and their application will be cheerfully sent upon your request.

THE LOUIS ALLIS CO., MILWAUKEE, WIS.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VISION
WITH progressive vision and confidence, and with lines of Bronze, Iron and Steel valves, OIC Distributors today are equipped to serve you efficiently. And they are laying a solid foundation on which to serve you better tomorrow.
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Virginia's Pulpwood Supply

S. G. HOBART, Chief, Forest Management
Virginia Forest Service

▸▸▸ IN VIRGINIA, there are ten pulp mills—a greater number of mills than in any other southern state. Five of these plants use pine pulpwood exclusively—practically all of this being cut from loblolly, shortleaf, and Virginia pine stands. One plant uses yellow pine principally, but will admit a mixture of up to twenty per cent of the soft hardwoods; two utilize yellow poplar and the soft hardwoods exclusively; one uses both pine and almost any of the hardwood species; and one uses principally spent chestnut chips from extract plants in the manufacture of hard board.

The nine of these plants using pulpwood as a raw material, processed in 1940 a total of 834,300 standard cords, according to figures compiled by the United States Forest Service. The actual pulpwood drain from Virginia's forests was 686,500 cords, according to the same compilation. The balance of exchange between cuttings and purchases by Virginia mills in adjoining territory and shipments of pulpwood from Virginia to out-of-state mills amounted to an importation of 147,800 standard cords of pulpwood, or about 17.7 per cent of the wood processed. This of itself does not necessarily indicate a shortage of pulpwood in Virginia. Rather it reflects the operation of timberlands owned by Virginia mills in adjoining states, or purchases from other states by mills located near the state line.

This pulpwood drain of 686,500 standard cords amount to 13.4 per cent of the total commodity drain for 1940. Broken down by species, the drain and relative importance of the pulp and paper industry in Virginia in 1940 is shown in Table I.

The pulp and paper industry in Virginia in 1940 employed 27 per cent of the wage earners engaged in the wood products industry and paid more than 35 per cent of the wages, amounting to almost $14,000,000. Virginia farmers and other timberland owners derive an annual income of more than $5,000,000 from the sale of pulpwood, and the value of the products of this industry in Virginia is in excess of $67,000,000 annually. The industry is of great importance to the State, and one which is a very considerable part of the general forest economy of Virginia. It is important, therefore, to consider most carefully the probable future of the source of the necessary raw material.

In the forests of the entire State in 1940, with all species and all size classes considered, the total commodity drain was only 66.6 per cent of the net growth. However, a large part of this surplus was in hardwood species, and in the softwoods, which supply more than 87 per cent of the pulpwood harvested, growth exceeded drain only by the narrow margin of about 14 per cent, and in all three of the forest regions of Virginia reported upon by the forest survey the drain-growth figures show a deficit for 1940 in certain size classes. The situation is most acute in the Piedmont region, which in 1940 produced approximately one-third of the total cut of pulpwood. The surpluses and deficits of growth over drain by region, diameter groups and species groups are shown in cubic feet in Table II.

Coastal Plain

Four mills in the Coastal Plain region of Virginia in 1940 consumed 393,000 cords of round wood plus some 31,000 cords of slabs purchased from sawmills. Eighty per cent of the round wood consumed was loblolly and shortleaf pine, the remaining 20 per cent being Virginia pine. Approximately 28 per cent was cut from trees in the 6 and 8-inch diameter classes (5.0 to 8.9 inches), 62 per cent from

Pond pine in Nansemond County, Virginia. A thinning was made in 1941.

10 and 12-inch classes, and 10 per cent from larger trees. About one-half of the total consumption of pulpwood in the State in 1940 was in the Coastal Plain.

Of the actual pulpwood drain in Virginia in 1940, the Coastal Plain cut 50.8 per cent, including 45.4 per cent of all the Virginia pine, and 61 per cent of all loblolly and shortleaf pine harvested for pulpwood in that year. Pines represented almost 98 per cent of the pulpwood cut in this region, which accounted for 16.6 per cent of the total commodity drain.

The 1940 drain for all commodities cut from shortleaf and loblolly pines resulted in deficits of 2.9 million cubic feet over net growth in both the 10-12 inch (9.0 to 12.9 inches) and the 20 inches and over diameter classes, but this total deficit was offset by surpluses of 6.6 million cubic feet in the 6-8 inch class (5.0 to 8.9 inches) and 13.1 million cubic feet in the 14-18 inch class (13.0 to 18.9 inches), making a total surplus for the species of 13.9 million cubic feet. Virginia pine shows a surplus of net growth over drain of one million cubic feet, although there was a deficit of 1.8 million cubic feet in the 10-12 inch class. The total softwood surplus amounted to 13.1 million cubic feet, since the "other softwoods" drain resulted in a deficit. But this surplus made up only about one-half of one per cent of the total softwood growing stock as of January 1, 1941.

About half of the softwood drain for pulpwood and similar cordwood material was from 10 and 12-inch trees. About 36 per cent of the total softwood drain came from this diameter class. In addition, an unusually large volume of 12-inch trees moved into the 14-inch class during 1940, and this recruitment accounts for about 70 per cent of the total increment in the 14-18 inch group. While this does not affect the total softwood surplus, it does indicate that a considerable amount of the present softwood growing stock is in trees of about 13 inches diameter.

The net change by species figures also indicate a critical condition in the pulpwood sizes and species. The cutting of pulpwood from the 6-8 inch group, except for thinnings where needed, is uneconomical, and in the 14-18 inch group the pulp operator must compete with the lumberman. Unfortunately, in the wartime stimulation of the lumber business, there has actually been some competition between the lumberman and the consumers of cordwood-size material even in the two smaller diameter groups. If this competition could be limited to the 14-18 inch group, probably all forest operators would be benefited and the small surplus might be sufficient for a continuing supply.

All the increment figures are, of course, based on the assumption that the composition of the stand will remain as at present. These figures and any predictions based upon them will be upset by a transition from pine to hardwoods. Such a transition is to be expected unless steps are taken to insure an adequate reproduction of pine. All of the pulp and paper companies in the Coastal Plain realize this and are working to this end upon their own lands. Their influence upon farmers and others from whom they buy wood is making itself felt, but there is still a great deal of clear-cutting with no thought to the future, especially on the part of small sawmills, stave mills, and the like. Virginia law provides for the leaving uncut and uninjured of four pine seed trees per acre where the stand cut consists of fifty per cent or more of loblolly or shortleaf pine, but this law is contingent upon local approval by the counties. It has been adopted in fifteen of the thirty-four Coastal Plain counties. This law is undoubtedly a step in the right direction, but exceptions in the law and the fact that the mere leaving of seed trees in mixed stands will not guarantee an adequate pine reproduction without some seed-bed preparation make it fall far short of an adequate regulatory measure. A program of assistance to farm forest owners has been initiated, and it is felt that only such a program plus a strengthened regulatory law will approach a solution of the problem.

Table I*

Species	Per cent of Total Cut of Pulpwood	Total Drain (cords)	Pulpwood Drain (cords)	Per cent of Species Drain Used for Pulp
Virginia Pine	23.3	606,200	159,900	26.3
Loblolly and Shortleaf Pine	64.3	2,369,900	441,300	18.6
Other Softwoods	—	133,900	—	—
Oaks	2.5	1,164,600	17,500	1.5
Gums, Yellow Poplar	8.1	533,300	55,500	10.4
Other Hardwoods	1.8	323,100	12,300	3.8
Total	100.0	5,131,000	686,500	13.4

(*) Data from Forest Survey.

Piedmont

The two mills in the Virginia Piedmont region are located near its western boundary. These plants, in 1940, processed only a relatively small portion of the 227,500 cords of pulpwood of all species harvested within the region, the greater part of which was shipped by rail over distances up to 200 miles to plants located in the Coastal Plain and Mountain regions of Virginia and other states. This does not include one mill producing tannic acid and hard board from chestnut, nor the chestnut wood cut for this purpose. This pulpwood harvest represents about one-third of the entire pulpwood cut in Virginia in 1940, and 70 per cent of the Piedmont cut was pine, of which 38.7 per cent was Vir-

ginia pine and 31.3 per cent was loblolly or shortleaf pine. The greater part of this was cut in the central Piedmont counties.

The 1940 total drain of shortleaf and loblolly pine for all commodities exceeded net growth in all diameter groups except the 6-8 inch, which showed a surplus of only 5.2 million cubic feet, resulting in a net deficit for the species group of 10.3 million cubic feet. Expressed in per cent, drain represented 120.2 per cent of net growth. The reduction of growing stock resulting from this deficit is 1.2 per cent. The distribution by diameter classes of this reduction is as follows:

Diameter classes (inches)	Net change in growing stock (per cent)
6— 8	1.4
10—12	–2.3
14—18	–3.2
20 and over	–15.2
All diameters	–1.2

The total drain of Virginia pine, however, fell short of the net growth in 1940 by 27.8 million cubic feet, which amounted to an increase of 4.1 per cent in the growing stock of this species. Therefore, for the two species groups from which 70 per cent of the pulpwood of the Piedmont is cut, the net change in growing stock in 1940 was plus 17.5 million cubic feet, or, expressed in per cent, an increase of 1.1 per cent. However, Virginia pine is a less desirable species than is shortleaf or loblolly pine, both in utility and from the standpoint of the silviculturist, and for that reason these figures do not afford too much encouragement. Enough of the annual cut should be shifted from shortleaf pine to Virginia pine to assure some chance of increasing the total net growth of the better species.

Stand of loblolly pine in King William County, Virginia. This stand was selectively cut in 1941, removing 13.7 units of pulpwood per acre. A reserve stand of approximately 10 units per acre remains as growing stock.

Of the present pine growing stock, approximately 48 per cent is in the 6-8 inch diameter class, 38 per cent in the 10-12 inch class, 13 per cent in the 14-18 inch class, and only a little more than 1 per cent is in trees of the 20-inch class or larger. In view of this, it is not surprising that deficits appear in the two larger size classes.

The net changes in growing stock of the hardwood species which supply the remaining 30 per cent of the pulpwood cut in the Piedmont regions are surpluses in each case, both as to

Table II*—Net changes in growing stock of all material, Virginia, 1940.

Region and Diameter Group	Species Groups						
	Shortleaf and Loblolly Pines	Virginia Pine	Other Softwoods	Oaks	Gums, Yellow Poplar	Other Hardwoods	All Species
	Million Cu. Ft.	*Million Cu. Ft.*	*Million Cu. Ft.*	*Million Cu. Ft.*	*Million Cu. Ft.*	*Million Cu. Ft.*	*Million Cu. Ft.*
Coastal Plain:							
6- 8 inches	6.6	2.5	—0.8	5.5	9.5	4.9	28.2
10-12 inches	—2.9	—1.8	—0.5	3.0	3.9	1.5	3.2
14-18 inches	13.1	0.3	.....	4.9	9.1	3.6	31.0
20 and over	—2.9	.....	—0.5	1.0	1.1	2.8	1.5
All Diameters	13.9	1.0	—1.8	14.4	23.6	12.8	63.9
Piedmont:							
6- 8 inches	5.2	14.8	1.0	6.7	8.4	9.0	45.1
10-12 inches	—7.9	11.1	.....	1.9	4.2	2.9	12.2
14-18 inches	—4.4	1.9	0.1	11.5	6.7	6.0	21.8
20 and over	—3.2	.....	0.1	3.7	2.8	1.9	5.3
All Diameters	—10.3	27.8	1.2	23.8	22.1	19.8	84.4
Mountain:							
6- 8 inches	—0.8	2.5	1.4	6.9	1.2	9.0	20.2
10-12 inches	0.8	2.0	1.2	1.7	—0.2	0.7	6.2
14-18 inches	0.8	.....	—1.2	0.5	0.7	3.0	3.8
20 and over	.....	.....	—1.0	—1.2	0.3	0.5	—1.4
All Diameters	0.8	4.5	0.4	7.9	2.0	13.2	28.8
All Regions, All Diameters	4.4	33.3	—0.2	46.1	47.7	45.8	177.1

(*) Data from Forest Survey.
The solid cubic volume, excluding bark, of all sound material of trees 5.0 inches d.b.h. and larger between stump and a minimum diameter of approximately 4.0 inches outside bark.
Cord estimates include bark. The solid cubic contents of a cord will vary with diameter of stick and bark thickness. Average for all species and all diameters is 68.2 cubic feet, the average for softwoods being somewhat higher and for hardwood somewhat lower.

All that remains of a loblolly pine stand after clear cutting. Note the absence of growing stock or seed trees. Hardwood replacement is certain.

diameter classes and species totals. There is an adequate supply of hardwood material to meet pulpwood and other demands, although certain other types of high quality hardwood materials now in demand and which might well be produced here are not to be found in quantity.

The forests of the Piedmont have suffered considerably from over-cutting and from harmful cutting practices. The same tendency of mixed pine stands to reproduce in hardwoods which has been commented upon in connection with the Coastal Plain is to be observed here to a still greater degree. Only seven of the 35 counties have adopted the seed tree law. Efforts are being made to afford assistance to landowners in timberland management, but more effort of this kind, coupled with an adequate regulatory law, is needed to bring about a satisfactory forest practice.

Given adequate fire protection and proper management the net growth of the Piedmont forests could easily be doubled, but it will require time to increase the stocking of these areas and bring the new trees up to merchantable size. The timber growing potentialities of the region are good, but the forests have been mistreated.

Mountain

The three pulp mills in the Mountain region of Virginia include two which use yellow poplar and other soft hardwoods and one which uses pine and almost any hardwood species. The cut of pulpwood in this region in 1940 was 109,900 cords, or about 16 per cent of the total for Virginia. Hardwoods made up 45.7 per cent of the pulpwood cut. Virginia pine accounted for 32.2 per cent, shortleaf pine 31.1 per cent, and yellow poplar 20.3 per cent of the total.

Of the total stand in the Virginia mountain region, shortleaf pine makes up 8.4 per cent, Virginia pine 3.6 per cent, oaks 50.6 per cent, gums and yellow poplar 8.6 per cent, and other hardwoods 22.3 per cent of the total cubic volume. The 1940 net growth shows a surplus over commodity drain for all species, although deficits appear in the 6-8 inch diameter class for shortleaf pine, in the 10-12 inch diameter class for gums and yellow poplar, and in the 20 inches and over diameter class for oaks. The net changes in growing stock, expressed in per cent, are as follows:

Species Group	Net change in growing stock (per cent)
Shortleaf	0.4
Virginia Pine	4.7
Oaks	0.5
Gums and Yellow Poplar	0.8
Other Hardwoods	1.8

Conclusions

1) The two most valuable pulpwood species (loblolly and shortleaf pine) are being overcut on the basis of present growth.

2) The overcutting of these species is most serious in the Piedmont region.

3) Virginia pine in the Piedmont region is being undercut. More of this species should be utilized for pulpwood and similar products in order to bring the growth and drain of shortleaf and loblolly pine in that region into balance.

4) War demands have stimulated the cutting of sawlog material more than the cutting of pulpwood. As a result of this, many small trees are being wastefully cut into logs and lumber which might more profitably be left to grow, or, where thinning or improvement cutting is indicated, be cut into pulpwood or a similar product.

5) Virginia's pine forests have sufferred from harmful overcutting, and are in many instances being replaced by inferior hardwood species. This is especially true in Piedmont Virginia, where stands are generally understocked.

6) Given adequate protection from forest fires and proper forest practice, the volume growth per acre of the average stand (which averaged 0.5 cord in 1940) could be doubled.

7) A proper forest practice may be insured by assistance to landowners in their forestry problems, together with a sound regulatory law providing for the setting up of proper minimum rules of forest practice for each region.

Table III*—Distribution of 1940 Pulpwood Drain by Regions and Species Groups

Region	Species Groups											
	Virginia Pine		Loblolly Pine Shortleaf Pine		Oaks		Gums and Yellow Poplar		Other Hardwoods		All Species	
	Cords	Per Cent of Species Total	Cords	Per Cent of Species Total	Cords	Per Cent of Species Total	Cords	Per Cent of Species Total	Cords	Per Cent of Species Total	Cords	Per Cent of Total
Coastal Plain	72,500	45.4	269,300	61.0	.....	.....	7,300	13.1	.....	.....	349,100	50.8
Piedmont	61,900	38.7	137,900	31.3	400	2.3	25,900	46.7	1,400	11.4	227,500	33.2
Mountain	25,500	15.9	34,100	7.7	17,100	97.7	22,300	40.2	10,900	88.6	109,900	16.0
		Per Cent Total		*Per Cent Total*		*Per Cent Total*		*Per Cent Total*		*Per Cent Total*		
Entire State	159,900	23.3	441,300	64.3	17,500	2.5	55,500	8.1	12,300	1.8	686,500	100.0

(*) Data from Forest Survey.

A Review of the Literature on

WET STRENGTH PAPER

T. T. COLLINS, JR.

▸▸▸ THE PROPERTY OF WET STRENGTH, coupled with such characteristics as greaseproofness, water-repellency, flameproofness, absorbency, etc., makes possible many useful types of papers. Absorbent papers which are to be impregnated with aqueous solutions and other modifications which will meet their most rigorous test in their usage requirement of being soaked with water over long periods of time should possess resistance to disintegration without impairment of other desired qualities.

Although at present there are wartime shortages or restrictions on many materials, particularly the various resins, used in the manufacture of wet strength papers, the potential uses in the food packaging industry alone for papers with this important characteristic are so numerous and of such volume that important postwar developments can be predicted. Swezey (*1*) has discussed the uses of wet strength paper in food packaging as well as some of its other wartime purposes, and has given some practical demonstrations of the phenomenon of wet strength in paper. Brackett (*2*) has said that one of the most satisfactory papers yet devised for packaging frozen foods is a plasticized wet strength paper of high stretchability which is coated with a thermoplastic composition.

"Wet Strength" Defined

The Dictionary of Paper (*3*) defines wet tensile strength as "the tensile strength of a specimen of paper after it has been wetted with water under specified conditions. The wet strength may be of a more or less temporary nature, as in paper towels and tissues, or of a more permanent nature, as in bag papers, cookery parchment, etc., where the paper is in contact with water for longer periods of time."

In elaborating this definition of wet strength it can be said that wet strength papers, in general, are those which have been fabricated to meet the specification of not disintegrating upon wetting with water or aqueous solutions until the use requirements for which the wet strength is intended have been fulfilled. The term, resistance to wetting, is not necessarily synonymous with wet strength although this property may serve the same purpose in many cases and is often confused with it. True wet strength is best exemplified by highly absorbent paper which permanently retains much of its dry strength when completely saturated with water rather than by ordinary hard-sized or water-repellent sheets which retain strength only so long as the time required for moisture to permeate the entire fibrous structure of the paper. Between these two extremes are papers which possess various degrees of temporary wet strength resulting from controlled wetting or absorbency, but they are not wet strength papers in the true sense of the word.

Classification of Wet Strength Papers

Wet strength papers can be classified roughly in the following divisions:

A. Temporary wet strength

1) Absorbent type—Used for toweling, impregnating stocks.

2) Non-absorbent type — Surface coating with aqueous solutions.

B. Permanent wet strength

1) Absorbent type—Toweling, impregnating stocks, twisting papers, etc.

2) Hard-sized or water-repellent types which possess true wet strength as well—Useful for waxing, the manufacture of grocery bags, frozen food wrappers, waterproof sandpaper, etc.

Since the importance of the fundamental property of wet strength was recognized by paper manufacturers and their suppliers, much research work has been carried on and many workable processes have been developed and patented. Because of the recent interest in this subject, a review of the various methods for producing wet strength in paper is somewhat timely for summarizing our knowledge to date.

Parchmentizing

The treatment of paper with parchmentizing and vulcanizing agents produces probably the most permanent and highest degree of wet strength, but at considerable cost of materials and equipment. This is probably the oldest process for imparting wet strength to paper and the literature concerning this subject is so voluminous that it can be considered to be outside the scope of this review. One description of this process is a patent issued to Alm (*4*) specifically covering wet strength paper made by parchmentizing, which is disintegratable in sewage or by acids and alkalies.

Viscose and Regenerated Cellulose

The use of viscose for producing wet strength in paper has been the subject of numerous patents. Richter, Schur, and Rasch (*5*) increased the wet strength, but did not decrease the absorptive capacity of paper by regenerating cellulose *in situ* from a solution of viscose by tub sizing the sheet with the viscose solution (washed with a setting bath of sodium bisulphate and sulphuric acid, then treated with a sulphide-removing bath of sulphurous acid), by precipitating the viscose in the beater with an acid or acid salt, or by producing the viscose in the web itself (passed the paper through a mercerizing bath of caustic soda, then through a bath or atmosphere of carbon bisulphide, and finally through the acid precipitating bath).

Shoemaker (*6*) coated waterleaf paper with viscous viscose in discontinuous strips and then coagulated it with sulphuric acid and sodium sulphate. The sheet was then neutralized and bleached. Another modification in this same patent was to laminate several of the sheets before the cellulose was regenerated so that it would serve as the

This paper is a review of the literature on wet strength paper and its manufacture using viscose, glue, casein, synthetic resins, locust bean gum, high drying temperatures, esterifying agents, cellulose ethers, etc. The use of plasticizers and wetting agents is discussed along with a general outline of methods used in testing wet strength papers.—AUTHOR'S NOTE.

adhesive. In place of viscose the inventor suggested the use of cellulose dissolved in caustic soda below 0 deg. C., cuprammonium solution, sulphocyanides, or strong mineral acids.

A similar idea was patented by Sherman (*7*) who coated opposite surfaces of toweling with waterproof material; such as, viscose, colloidal bakelite, latex, asphalt emulsion, or glue tanned with formaldehyde or bichromate, so as to get lateral capillary absorption rather than through wetting. The same waterproof materials were also applied as a design or as reinforcement lines.

Because saturating papers, made for impregnating with emulsions of latex, with glycerine, glue, etc., must be absorbent and have high wet strength, Moses (*8*) lightly sized a porous sheet by adding to the beater a cellulose which was only partly converted to viscose, so that no precipitant would be needed to set it.

McKee (*9*) prepared filter papers of variable porosity by increasing the regenerated cellulose content rather than by densifying or thickening the sheet. A special viscose made with a minimum of caustic soda and carbon bisulphide was added to the beater, stuff chest, or head box of the paper machine and no precipitant was used other than the heat of the dryers or a small amount of alum. To remove the free sulphur from the cellulose xanthate which would appear in the finished sheet, the inventor added sulphur dioxide or sodium sulphite to the pulp slurry in order to convert sulphur to sodium thiosulphate which would be removed from the web with the white water.

Use of a viscose which regenerated to give cellulose on drying was patented by Schur (*10*). Low alkali concentration was used and the viscose was neutralized with boric acid while air was bubbled in to remove the hydrogen sulphide formed. The resultant solution was claimed to be stable in the cold but would gel at higher temperatures. The inventor said this solution gave higher wet strength than treatment with ordinary viscose followed by a regenerating agent, besides being much simpler to apply to pulp slurry, to the wet web on the wire, or by tub sizing. It was also recognized that prolonged heating on the paper machine or standing for several days at room temperature results in the development of *ultimate* wet strength.

Richter and Schur (*11*) patented multiple sheets, some of which contained regenerated cellulose.

Twisting paper for the manufacture of paper twine, containing regenerated cellulose added at the beater or by tub sizing, was claimed to have superior wet strength and could be twisted at a higher rate of speed according to Richter and Schur (*12*).

Richter and Schur (*13*) made a water-repellent paper of high wet strength by impregnating a sheet with a viscose and boric acid mixture so that cellulose would be regenerated on the drying drums. The odoriferous sulphur from the viscose was removed by passing the sheet through a bath of alum or chlorine water before the final drying. Water-repellency was then given the sheet by waxing it with molten paraffin or by applying the wax from solvents or from emulsions. Another variation was to impregnate paper with viscose mixed with wax-rosin size emulsion or to add these same materials to the beater and precipitate them with alum.

Yates (*14*) patented a paper to be used for wiping oily printing plates, etc., which had wet strength resulting from the regeneration of cellulose from viscose. Ammonium carbonate was added to the viscose so that some of the sulphur compounds would be destroyed when the sheet was dried. The malodorous sulphides were also removed by treating the sheet with glycerine in which was dissolved chlorine gas or by treatment with hydrogen peroxide or hypochlorites.

A sheet with main interior body containing a continuous phase of wet strengthening material such as cellulose regenerated from viscose with a surface layer of soft and fluffy texture was patented by Richter (*15*). Boric or acetic acid were added to the viscose solution so that it could not gel until the paper was dried. The sheet was coated with this viscose and before it was dried, pulp fibers in a stream of air were blown onto the wet sheet and those which did not become attached were removed by suction boxes. The paper was then dried and heated to set the viscose.

Schur (*16*) patented wet strength paper processed "without serious impairment of its water-absorptivity either in the sense of water-holding capacity or in the sense of rate of inhibition or take-up of water." Towelling was treated with wetting agents mixed with viscose solution and the inventor claimed the wetting agent aided in the subsequent deodorizing treatment with chlorine gas. Data given showed the effects of wetting agents in increasing the water absorption of the stock.

A sheet treated with viscose solution and then with an acidified glue solution in order to regenerate cellulose in the sheet and to produce an exposed glue surface has been patented by Richter (*17*).

Cellulose regenerated from viscose was used for producing wet strength in the patent of Richter and Schur (*18*).

Viscose has been used by Richter (*19*) to give wet strength to paper which is to be parchmentized, vulcanized, or mercerized in local portions. The areas not to be parchmentized were printed with the viscose mixed with a water-repellent size; such as, glue or rubber latex, so that the sized areas would not be affected by the parchmentizing solution to any great extent. An alternate method proposed was to add the regenerated cellulose to the paper stock in the beater or to the wet or dry web of paper. The areas to be protected against the chemical action of parchmentizing, mercerizing, etc., were then printed with the water-repellent solutions. It was noted that the addition of wetting agents increased the absorptivity of the sheet whereas an increase in the regenerated cellulose content or the addition of rosin or wax emulsions had the reverse effect. Alum was used as the setting agent for both viscose and size.

Both water-absorbent and water-repellent wet strength papers were made by the process patented by Hans (*20*) which consisted of using a viscose solution containing tung and linseed oils, etc. This solution applied to a sheet and then neutralized with alum gave water-repellency while the addition of sulphonated castor oil and pine oil to the mixture made the paper highly absorbent.

Schur (*21*) used viscose, among other things, as a binder in wet strength paper.

Wet strength paper for varnishing, oiling, lacquering, or the manufacture of waterproof sandpaper was produced by beater or tub treatment with a viscose solution neutralized with boric acid and ammonium carbonate by Oglesby (*22*).

Wallach (*23*) added an aqueous dispersion of viscose to the wet web of fiber on the paper machine wire and precipitated it in the sheet by heat or coagulation in order to produce wet strength paper.

The use of cellulose regenerated from cuprammonium solution has been mentioned by Richter, Schur, and Rasch (*5*) and by Richter (*15, 19*). The former group also produced wet strength paper by passing the web through a solution of cellulose nitrate in organic solvents, evaporating the solvents, and then regenerating the cellulose with a denitrating solution of sodium sulphide.

Glue and Casein

Waterproof reinforcement lines of glue tanned with formaldehyde or bichromate were used on toweling by Sherman (*7*).

Alternate methods of producing wet strength saturating papers using glue or casein sizes were mentioned by Moses (*8*).

In the patent of Richter and Schur (*13*), glue was incorporated in the viscose solution to increase the wet strength and also to make the sheet somewhat grease-resistant so that in waxing the paraffin would form a surface layer rather than penetrate into the sheet.

Glue and casein as wet strengthening agents were mentioned by Richter (*15*) and Schur (*16*).

Schur (*21*) used ammoniated casein or glue with formaldehyde, casein and rosin size in the beater, or sodium caseinate for tub sizing while Oglesby (*22*) used glue-glycerine tanned with paraformaldehyde, formaldehyde, hexamethylene tetramine, or chrome alum.

A dilute solution of glue and formaldehyde for imparting wet strength to waterleaf sheets was used by Harrigan and Krauss (*24*). Gelling of the solution was prevented by keeping the concentration of the glue-formaldehyde low.

According to Schur (*25, 26*), if less than 5 per cent tanned glue were incorporated in a waterleaf sheet, it still retained its absorptivity but gained wet strength. For a tub solution, glue was mixed with formaldehyde, alum, or tannic acid together with glue preservatives.

Mains (*27*) found that paper to be impregnated with resin solutions for making moulded products is more satisfactory when given wet strength by sizing with glue tanned with formaldehyde in the same solution.

Anderson (*28*) impregnated unsized paper with glue and treated it with formaldehyde so as to render it superficially water-insoluble while leaving the glue in the interior of the sheet still water-soluble. An attachment for processing the paper on an ordinary paper machine was also designed.

Resins

In the use of synthetic resins for producing wet strength, the paper industry has lagged behind the textile industry. Some of the same resins, used for many years to make fabrics resistant to crushing and strong when wet, have been applied to paper with little modification of formulation or technique in more recent time. At a very early date, Ruff (*29*) increased the wet strength of cloth by impregnating it with a mixture of cresol, formaldehyde, and sodium hydroxide followed by heat treatment in an atmosphere of carbon dioxide. The formation of sodium carbonate aided in condensation of the water-insoluble resin.

The patent issued to Foulds, Marsh, and Wood (*30*) shows them to be important pioneers in this field. They treated fabrics with water-soluble phenol-formaldehyde, acetone-phenol-formaldehyde, and urea-formaldehyde resins and then polymerized the insoluble form of the resin on the fibers.

Heuck and Esselmann (*31*) used the water-soluble, alkaline monomers, dimethylolurea or dimethylolthiourea, together with acid-forming catalysts and heat to produce an insoluble resin polymer. used for increasing the wet strength of viscose or cuprammonium cellulose threads.

In his review of the literature on wet strength producing resins for textile use, Clayton (*32*) mentioned the use of water-soluble urea-formaldehyde and phenol-formaldehyde resins.

The water-soluble condensation product of thiourea and formaldehyde, when mixed with starch or other textile fillers and an acid catalyst; such as, oxalic acid or potassium textroxalate, made them water-insoluble according to the patent issued to Rossiter and Davis (*33*). Heat treatment was utilized to polymerize the resin in its final stages.

Ellis (*34*) reviewed the known reactions of urea-formaldehyde resins and their applications to the manufacture of wet strength textiles and papers.

The addition of an acidic solution of an aniline-formaldehyde resin to pulp in the beater together with an alkaline catalyst to render it water-insoluble is the basis of one patent (*35*). Another variation was the addition of the precipitated resin to the beater or use of the acidic resin solution as a tub size followed by washing the sheet in an alkaline precipitating bath.

A patent issued to the American Reenforced Paper Company (*36*) speaks of treating paper with resins so as to render the individual fibers unaffected by variations in humidity, wetting, etc. The resins were formed from a solution of formaldehyde and urea or thiourea with ammonium thiocyanate or chloride as the catalyst. As an alternate treatment, a cresol-formaldehyde resin was suggested. In both cases the insoluble resin was polymerized in the sheet by heating.

Bowen and Dyke (*37, 38*) used a resin formed of urea or thiourea, formaldehyde, and zinc chloride. When mixed with cooked starch, glue, casein, or gum arabic and oxalic acid catalyst to make a tub size, high wet strength and varnish-resistant papers were produced.

Suitable water soluble vinyl acetal resins produced by the reaction of aliphatic aldehydes; such as, formaldehyde, etc., with a polyvinyl alcohol have been used in the manufacture of wet strength papers for photographic use by Lane and Peters (*39*). They found polyvinyl acetal resins having cold water solubility could be prepared by adding less aldehyde than would be required to react with all hydroxy groups in the polyvinyl alcohol. The soluble resin was added to the cold beater in the papermaking operation, the beater warmed to precipitate the resin and on drying the paper the insoluble resin became tacky and cemented the fibers together. Several patents (*40, 41, 42, 43*) have recently been issued on the process of utilizing dimethylolurea together with an acid-producing catalyst for producing wet strength paper. One of these (*40*), mentions the alternate use of phenol-formaldehyde, phthalic anhydride-glycerol, phenol or urea and furfural, phenol or urea and higher aldehydes, and phenol or urea and hexamethylene tetramine resins for the same purpose. A mixture of urea and formaldehyde in the unreacted state together with a suitable catalyst was also said to be applicable for these purposes. Two of those patents (*41, 42*) describe the preparation and use of the monomeric dimethylolurea and its final polymerization to the insoluble form on heating at elevated temperatures in the presence of acid-producing neutral salts or acid catalysts and retarding agents; such as, soya protein or casein. The sheet was finally neutralized with sodium bicarbonate and treated with a wetting agent to give it the desired absorbency.

Another patent (*44*), which may or may not concern wet strength paper, speaks of a pulp sized in the beater with resin or wax, together with mixed cellulose ethers derived from low molecular weight alcohols and glycolic acid, condensation products derived from hydroxyethylmethyl cellulose and urea and formaldehyde or mono- or dimethylolurea, or casein or gelatin.

Meyers (*45*) has reviewed the literature on the use of urea-formaldehyde resins to produce wet strength paper. Mention was made of the reaction of this resin with starch and proteins and data was given to show the use of starch as an extender for the resin. The use of water-soluble, thermosetting, acid-precipitable phenolformaldehyde resins for beater addition was also suggested.

A recent patent (*46*) mentioned that increased or additive effect of the hot-shot treatment was obtained if paper so treated contained urea-formaldehyde resins or as alternates, acrylate polymers, phenol-formaldehyde condensates, and polyvinyl esters or compounds. The use of urea-formaldehyde resin with rosin size in a sheet was mentioned as was the addition to

the beater of an intermediate stage urea-formaldehyde polymer which could be precipitated by alum. The use of alkaline polymers or emulsified forms of the same resin for beater work was also mentioned.

An excellent outline of the chemistry of urea-formaldehyde resins and their applications in making wet strength paper has been given by Taft (*47, 48*). The use of acid and acid-producing catalysts as well as the use of ammonia to prevent condensation of the resin in its insoluble form from a too-acid solution were discussed. This author remarked upon curing the resin by heat treatment, acidity, or a combination of both; effect of acid catalysts on the *p*H of the finished sheet; the use of starch as a resin extender; softening the sheet by methods of manufacture rather than by the addition of plasticizers; and loss of wet strength on aging of urea-formaldehyde treated sheets, particularly at high humidities.

Resin treated sheets which do not require heat treatment for setting the resin were described by Jackson and Wexler (*49*). The resin, either for tub sizing or beater addition, was composed of an emulsion of tung oil with cobalt linoleate dryer. A glycerine-phthalic anhydride condensation resin was added to the tung oil before it was emulsified.

Menger (*50*) discovered some very interesting information concerning thermosetting urea-formaldehyde resins in the presence of an acid-producing catalyst; such as, ammonium chloride. When the resin was used as an adhesive, its polymerization would take place so rapidly that it could not be utilized successfully as an adhesive. By adding ammonia, urea, or a mixture of the two, the hardening of the resin was retarded due to the fixing of some of the free formaldehyde in the solution or some of the residual aldehyde groups in the resin monomer which would ordinarily react with the ammonia from the catalyst to form hexamethylene tetramine or probably a complex resin equivalent and release the strong hydrochloric acid which would harden the resin at too rapid a rate. It was also noted by Menger that the addition of ammonia allowed the use of more acid catalyst than usual, but that even with equal catalyst, ammonia slowed the initial acid condensation to the desired time with the ultimate result of speeding the final hardening to maximum strength. The use of rye flour as an extender for the resin was mentioned.

Maguire and Rote (*51*) mentioned the use of urea-formaldehyde resin for the manufacture of wet strength paper and the work of Meyers (*45*).

A recent patent (*52*) described the use of aminotriazine-aldehyde condensation products for producing wet strength in paper. A tub size was made of water-soluble melamine-formaldehyde resin with a catalytic mixture of hexamethylene tetramine and ammonium sulphate. Evidently the hexamethylene tetramine was present as a retarding agent to prevent or decelerate acidic polymerization of the resin while in solution with the catalyst. The resin was finally condensed by heating the paper. The use at the same time of other resins; such as, urea-formaldehyde, thiourea-formaldehyde, alkyd, and phenol-formaldehyde was mentioned and it was suggested they might be condensed in the presence of melamine resin.

Hofferbert (*53, 54*) patented the use of water-soluble melamine-formaldehyde and other aldehyde-aminotriazine resins for tub sizing wet strength paper. Acidic or acid-forming salts together with heating the paper were used to polymerize the resin to its insoluble form and wetting agents were used in the tub solution to increase the penetration of the chemicals into the paper.

Liander (*55*) made water-soluble urea-formaldehyde and melamine-formaldehyde resins and treated sheets of paper with them. He used alum, ammonium sulphate, or barium hydroxide as catalysts with the former and none with the melamine resin. He suggested the best possibility as being beater application but mentioned that urea-formaldehyde resins might not be precipitable in the beater. The addition of 2-3 per cent urea-formaldehyde resin to paper may result in a wet tensile test 50 per cent of that of dry paper, according to Lindberger (*56*).

Freeman (*57*) has treated absorptive paper with an aqueous solution of water-soluble cellulose ether and urea-formaldehyde resin modified with a polyhydric alcohol to form wet strength papers. The modified polyhydric alcohol-resin is set by drying the paper.

Bauer and Hawley (*58, 59*) have modified the use of urea-formaldehyde resins by treating paper in the size tub or at the press section at the wet end of the papermaking machine with water-soluble urea and formaldehyde either freshly mixed or in partly reacted state, drying the sheet and then treating it with acid-producing catalysts; such as, organic acids, organic sulphonic acids, acid salts, or amine salts, by means of a water-box on the calender stack. By this method the catalyst is added after the paper is dried and there is less harsh effect on the paper than there would be if the paper containing the acid-producing catalyst were subjected to heat. Thiourea was mentioned as replacing urea, and paraformaldehyde or acetaldol were suggested as substitutes for the formaldehyde.

Manufacturers of resins have issued bulletins on the use of their products for producing wet strength papers. Some (*60, 61*) described urea-formaldehyde resins using heat together with alum, aluminum chloride, or ammonium chloride as catalysts. The use of glue as an extender for the resin was also mentioned. Another (*62*) explains that the addition of ammonia to urea-formaldehyde resin catalyzed with aluminum sulphate destroys the catalytic effect unless the solution remains on the acid side. This is not the case when acid salts are used and there is merely a retarding action on the resulting acidity. Modifiers for this resin are starch, glue, or casein. Another bulletin (*63*) discusses melamine-formaldehyde condensation products which can be added to the papermaking stock anywhere from the beater to the forming wire. One of the major claims for this process is that the treated paper does not lose its wet strength on aging under conditions of high temperature and humidity as does paper which is tub sized with urea-formaldehyde resin. In another place (*64*) it has been pointed out that this resin increases the dry fold, burst, and tensile tests as well as the water-resistance of rosin-sized papers. A communication (*65*) recently received mentioned the development of water-soluble urea resins for tub sizing and beater addition, and spirit-soluble urea resins and carbic alkyd emulsions for beater application in the manufacture of wet strength paper.

Miscellaneous Processes

In addition to the four major methods of producing wet strength paper, there are many other treatments known, some of which have found commercial application.

Ek (*66*) recognized the need for wet strength in paper toweling at an early date and said that it could be produced by digesting the wood for pulp with sulphate of soda or by impregnating the sheet with soap solution.

The mercerization of cellulose with sodium hydroxide to produce wet strength paper was suggested by Schur and Hoos (*67*) and Fournier (*68*). The former used the paper for manufacturing twine.

Scherbak (*69*) discussed the wet strength paper made by a process using colloids.

Esterification of the surface layers of paper with carboxylic acids, which resulted in wet strength, was patented by New and others (*70*).

Cellulose acetate applied to paper from an acetone solution containing wetting agents and organic plasticizers has been described in a patent issued to Richter (*71*). The binder was precipitated throughout the sheet by passing it through a water bath in which the acetone is soluble but not the cellulose acetate.

According to a technical sales bulletin (*72*), polyvinyl alcohol can be used to produce a temporary wet strength in toweling without loss of absorbency. This property can then be made permanent by insolubilizing the PVA with heat treatment, formaldehyde, etc.

Rowland (*73*) said that sheets treated with rosin size lost their absorbency on aging and incorporated in his size a triethanolamine emulsion of soya bean oil phospholipoids.

As early as 1905, Morris (*74*) produced wet strength paper by adding a linseed oil emulsion to pulp in the beater. Reid (*75*) heat treated chinawood or tung oil to initiate polymerization and with the addition of chemical dryers made an impregnating mixture which would not render the paper waterproof unless a large amount was used.

Richter (*76*) made a pulp yarn from a mixture of chemical wood pulp with hemp or other long fibers so as to get equalized wet and dry strengths. Richter and Schur (*77*) used a cellulose hydrate or glassine pulp to lend extra toughness to toweling stock.

A large percentage in a furnish of a pulp which has been treated with formalin and nitric acid gave stronger, absorbent papers according to Kantorowicz (*78*). Richter and Schur (*77*) also mentioned the use of chemical hydrating agents; such as, nitric acid, sulphuric acid and formaldehyde, zinc chloride, and potassium thiocyanate on absorbent papers. Other patents (*40, 41,* and *42*) described the treatment of paper with formaldehyde and alum with subsequent addition of neutralizing alkali, oxidizing agent for removal of excess formalin, and a wetting agent to facilitate penetration and impart the desired absorbency to the finished paper. Bauer and Hawley (*58, 59*) stated that treatment of paper on the paper machine with formaldehyde and an acid causes embrittlement on drying. Marquin (*79*) tanned viscose for increased wet strength with formaldehyde vapors or formalin in an acid solution.

Because viscose produced an odor and a discoloration in white paper that had to be removed by deodorizing and bleaching, Richter (*80, 81*) substituted the alkyl hydroxy ethers of cellulose; specifically, the hydroxy ethyl ether. The cellulose ether was dissolved in caustic soda, added to the beater, and precipitated with alum or nitre cake or used as a tub size with a second treatment to precipitate the ether of cellulose. A wetting agent was used to increase the absorbency of the finished product. Wallach (*23*) added aqueous solutions of cellulose ethers to the wet sheet on the paper machine wire and coagulated them in the paper by heat. Cellulose methyl ether has been added to the paper stock in the beater and precipitated by means of alum at a *p*H of about 4.6 according to another patent (*82*). The strength of the paper when wet with either alcohol or water was materially increased without loss of absorbency. Broderick (*83*) used the same cellulose ether or methyl or ethyl cellulose mixed with water-soluble aldehydes such as glyoxal or pyruvic aldehyde. In the absence of any catalyst, the acetal reaction occurred on drying the paper to give an insoluble binder. Increase in the treating solids beyond a certain point reduced the absorptivity.

Schur (*10*) first noticed the increased wet strength which resulted when treated papers were heated to fairly high temperatures for long periods of time. The same inventor used the hot shot treatment as the basis for another patent (*21*), either for raw paper or with paper which has been treated with various binders. This treatment was also found to be of advantage when the sheet was pretreated with resins (*46*).

Although uneconomical at the present time, a process has been developed for the incorporation of locust bean gum in wet strength papers. Hart (*84*) found that borax converts a solution of locust bean gum (carob seed, lakoe gum, St. John's Bread, manna, etc.) into a gel, irreversible even on boiling and used this as a qualitative analytical test for borates. Schur (*85*) mixed the gum with papermaking stock and sprayed the sheet with borax and soda ash to set the gel, making a paper for waxing stock, toweling, etc. A similar patent has been granted to Smith (*86*) who made a dispersion of the gum and mixed it with papermaking stock to get temporary wet strength after treating the sheet with alkali and alkaline earth hydroxides.

Incorporation of artificial or natural rubber in paper in the form of an aqueous emulsion to produce wet strength has been patented by Piette (*87*). The rubber was later vulcanized. More recently, Fairbanks (*88*) worked out a wet strength paper by impregnating the fibers with 10 per cent or less of a waterproof mixture of paraffin and chlorinated rubber.

Plasticizers

As there is a tendency for some wet strengthening agents or treatments to make the paper stiff, harsh, or brittle, plasticizing or softening the sheet is of primary importance.

For softening viscose treated papers, Shoemaker (*6*) used glycerine and soap mixtures, Richter and Schur (*13, 18*) used glycerine, and Yates (*14*) found chlorine-saturated glycerine suitable as both deodorant and plasticizer. Richter and Schur (*18*) found glycerine lowers the dry and wet strength of paper and cannot be mixed with viscose due to its coagulating effect. They used ethylene glycol or glucose as well as glycerine. Oglesby (*22*) softened a viscose-treated sheet with sorbitol and triethanolamine oleate.

Glue-treated sheets were plasticized with glycerine and soap by Schur (*25, 26*) and with glycerine alone by Anderson (*28*). De Witt (*89, 90*) took the wet strength paper made under Schur's patent (*25*) and rendered it soft and flexible by plasticizing with a glycerine-magnesium silicate coating or similar coatings made with various glycols and other inert fillers. The water-insoluble mineral filler absorbs the plasticizing agent and prevents its evaporation or loss by washing or contact with other materials, according to the inventor.

The plasticizing of urea-formaldehyde resin- treated sheets is quite necessary due to the effect on paper of acidity resulting from catalysts, the embrittlement of high temperature of drying, and the stiffening effect of the resin itself. Heuck and Esselmann (*31*) used monohydric alcohols, glycols, and glycerol while Bowen and Dyke (*37, 38*) used glucose or diethylene glycol. Taft (*47*) has mentioned that glycerine destroys the wet strengthening effect of urea-formaldehyde resin and suggested softening paper by manufacturing methods and physical treatment. Others (*62*) have said glycerine retards wet strength development and suggested glycols and invert sugar as being preferable.

Richter (*80*) used glycerine, soaps, and other polyhydric alcohols with the alkyl hydroxy ethers of cellulose. Broderick (*83*) used glycols or glycerol in a tub solution of the acetal condensation product of cellulose ether and aldehyde.

Testing for Wet Strength

A very important phase of the subject of wet strength is the testing of those kinds of papers. The methods have usually been designed for testing particular types of wet strength papers rather than the class as a whole.

Schur (*16*) devised a test for water

absorption in which ½ ml. of water was dropped in one spot on a sheet of the paper and the time for it to soak into the sheet was noted. He also used a wet tensile test in which the test strip was brushed with water and pulled apart in a tensile tester.

One inventer (*21, 46*) described a test in which sheets were soaked ½ hour in water and then four plies were burst together on a Mullen tester. The use of wet tensile and wet tear tests was also mentioned.

Bowen and Dyke (*38*) used a wet tear test and also mentioned a wet abrasion test.

Taft (*48*) remarked that tap, distilled, and sea-water give different results when used to wet samples for wet tensile tests. The higher value found when sea water was used was attributed to the total of dissolved solids in the water rather than the hydrogen-ion concentration.

Liander (*55*) dipped test strips in water for 5 seconds, blotted off the excess surface water, and ran tensile tests. The amount of wet strength resin in the sheet was determined by nitrogen analysis.

In testing paper twine for tensile strength and stretch in both the wet and dry states, Schur and Hoos (*67*) weighted the lower end of the string with a 200 gram weight before the lower clamp of the tensile tester was tightened in order to avoid the personal error factor in clamping specimens in the tester.

A Mullen bursting test on wet paper has been used by Broderick (*83*) to test for wet strength. Bauer and Hawley (*58, 59*) mentioned increased wet Mullen test and scuff resistance resulting from wet strength treatment of paper.

Smith (*86*) has given a test for aging a sheet to note its change in absorbency. According to Smith, heating a sheet for one hour at 100° C. is equal to one year of natural aging with regards to the absorbency test.

Reed (*91*) and Adlington and Alexander (*92*) were among the first investigators to run wet tensile tests on paper. The former (*91*) tested the paper in both the machine and cross-machine directions after immersion of the sample in water at 70 Fahr. for 20 minutes. It was found essential that conditions be standard as time of immersion and temperature of the water were said to have a marked effect on the results of the test.

Sadler (*93*) loaded strips of paper on one end and immersed the loaded end in liquid while noting the time of rupture. The influence of liquid, temperature, and load were determined.

A device for measuring the bursting strength and stretch of wet pulp handsheets was designed by de Montigny (*94*).

Since paper to be impregnated with phenol resins must have high absorbency and wet strength, one inventor (*95*) devised a test to be used on weak or thin papers. Since applying water to the test strip with a pipette or brush while it was clamped in the jaws of a tensile tester was found to be unsatisfactory, an assembly was devised to hold the dry paper in the tensile tester and then wet the section of the test strip looped around a rod. After that the force required to break the loop of wet paper was measured by the tensile tester. This method appears applicable only to the testing of highly absorbent papers which require only momentary wetting before testing.

TAPPI Standard Method T456 m-42 (*96*) for the determination of wet tensile breaking strength of paper specifies that absorbent samples are wet in the center of the test strip, blotted free of excess water, and pulled apart in the regular manner. Sized papers are to be soaked for longer periods of time, usually about four times the water resistance of the sample, and the strip wet from end to end is pulled apart in the tensile tester.

In addition to the above testing methods, the author has also used an absorption test in which the rate of climb of water up a strip of paper is measured.

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Motor Maintenance Prevents Breakdowns

W. R. HARRIS[1] and W. W. McCULLOUGH[2]

▶▶▶ THE EXISTING EQUIPMENT of the Pulp and Paper Industry must be kept in good operating condition until we've won this War. The industry is somewhat unique in that production schedules must be maintained continuously—24 hours per day, some 300 or more days a year under conditions which are far from favorable. In practically every department the electrical equipment is subjected to excessive moisture, and must operate in an atmosphere laden with chemical dust and fumes which attack exposed and unprotected electrical parts.

Maintenance of this electrical equipment presents an operating problem, the proper solution of which is of the utmost importance to the industry. An adequate and well supervised maintenance program will go far toward improving operating efficiency and in making existing equipment last for the duration.

The ideal motor maintenance program aims at prevention of breakdowns rather than their repair. Maintenance involves competent, periodic and systematic inspection. A thorough survey of each motor installation should be made and a systematic inspection and maintenance schedule established and enforced.

Records must be kept consistently on the schedule selected. Several excellent record systems have been developed and reduced to printed form, so that it is not necessary to go to the trouble and expense of devising individual systems.

Prevention of breakdowns may be helped by a thorough analysis of the equipment involved. For example, if the difficulty is the frequent tripping of overload relays, it may be the installation of a different type of relay with thermoguards on the motor will enable the motor to carry the loads without an injurious temperature rise.

Systematic Inspection

It is impossible to give any hard and fast rules for frequency of inspection. The following suggestions are based on average conditions.

Once a week check oil level in the bearings and see that the oil rings are moving freely. Check the temperature of the motor bearings and primary iron with the hand. Sniff the warm air coming from open motors. The fumes emanating from overheated insulation are unmistakable.

Once a month check the brush holders, brushes and shunts. Blow out the motor with compressed air.

Once a year check air gap with feeler gauge. Check insulation resistance with Megger. Check line voltage with voltmeter, and load with ammeter. Clean out and replace grease in ball and roller bearings. Check renewal parts stock in light of the past years' experience.

Every two years dismantle the motor. See that all windings are tight. Replace loose wedges and loose bands before dipping in varnish and baking. Inspect commutators and commutator connections. Sleeve bearings require no flushing. At intervals of about two years in average service, or during general overhaul periods, remove the bracket and wash out the bearing housing. Use hot kerosene oil and compressed air if available.

Faulty Bearings

All motors depend upon a mechanical assembly of some sort for the transformation of electrical energy into mechanical energy or work. The bearings are a very important link in this mechanical assembly.

Bearings probably cause more shutdowns, delay and expense, than any other cause. This is not surprising, when it is remembered that they are victims of poor foundations, misalignment, vibration, thrust from couplings, dirt under and over lubrication, and frequently the wrong lubricant—all this in addition to their real job of supporting a rapidly revolving part.

The first requirement of successful bearing operation is lubrication. This entails more than just an adequate supply of lubricant; the lubricant, the bearing design, and its condition, must be correct.

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(1) Industry engineer, Paper Mill Section; (2) maintenance engineer, Westinghouse Electric & Manufacturing Company.

Proper Lubrication

Sleeve bearings sustain the essential oil film to prevent metal-to-metal contact between the shaft and the bearing surface. Properly designed bearings have adequate area for the load, proper oil grooving, working oil rings, and suitable materials.

Safe operating temperature for bearings under normal operating conditions is considered to be 40C, rise above the surrounding room air. At this temperature a bearing feels only comfortably warm to the hand. Assuming proper mechanical condition of the bearing, whether sleeve or ball, and the bearing assembly, and assuming that proper lubricants are used, temperatures elevated above 40C. rise call for immediate investigation.

accident, or during the starting period. *Use the right babbitt.*

For sleeve bearings, proper maintenance keeps oil well filled to the proper level and the oil rings turning freely. New oil should be added only when the motor is at rest to prevent overfilling of the reservoir. Oiling of bearings is more often overdone than underdone. Sleeve bearings which require frequent refilling and thereby leak oil onto the stator windings should be replaced with sealed sleeve-type brackets and bearings.

LEFT—To assure proper maintenance and prevent sparking, it is necessary to undercut the mica below the surface of the faster-wearing copper commutator bars on a d-c. motor. This tool undercuts the mica to 1/16 in. below the commutator surface. RIGHT—A thorough maintenance program does not neglect brushes. Proper method of cleaning and surfacing is to press brush down in a strip of sandpaper placed between brush and commutator. Several passes should be sufficient depending on brush condition. The sandpaper should be held flat against the commutator surface to prevent rounding of the brush end.

Oil Film Lubricates Sleeve Bearings

In a sleeve bearing the oil sticks to the shaft and is dragged along by the rotation of the shaft so as to form a wedge-shaped film between the shaft and the bearing. This film of oil carries the load, and prevents metal-to-metal contact. So long as this film is established and maintained there is no metal-to-metal contact in the bearing while the shaft is rotating, and, therefore, no perceptible bearing wear.

Two outstanding considerations govern the maintenance of sleeve bearings: (1) Insure the existence of the oil film once rotation has begun. *Use the right oil.* (2) Minimize the destructive effects of metal-to-metal contact when the film is lost, either by

It is well known that oil rings generally carry far more oil than is necessary for proper lubrication of the bearing. When running, most of this oil is carried on the outside diameter of the rings by centrifugal force. This excess oil causes splashing and spray inside of the bearing housing. Air currents that pass through the housing pick this spray up and deposit it on motor windings. Sealing the bearing against the entry of air currents is therefore necessary and is accomplished in all modern designs by close tolerances, felt seals, and air by-passes to offset blower action of rotating parts.

The purpose of the felt washer in these seals is often misunderstood. The real purpose of the felt is to keep out air and dirt. In itself it has little value for preventing leakage of oil once it becomes oil soaked. Bearing wear, which means radial movement of the shaft, spoils the effectiveness of the bearing seals. Replace all felt seals at the same time when replacing sleeve bearings. These felt seals should be ordered from the manufacturer of the motor. If it is necessary to make them in an emergency, use high-grade felt not less than ¼-inch thick before compression. Make the inside diameter of the washer the same as the shaft or slightly less. Cut the felt true with edges at right angles to the surface of the felt.

Oil leakage is generally aggravated by high temperatures. Keep bearings cool and use an oil that does not foam easily.

Ball Bearing Maintenance

Ball bearings have become increasingly important with the use of totally inclosed and fan-cooled motors. In a sleeve bearing, as just explained, the shaft when in motion is separated from the bearing by the oil film. In a ball bearing, a series of steel balls act as the separating medium, both when the motor is stationary and when it is running.

To keep the steel balls uniformly distributed around the bearing a cage or retainer is used, each ball having its own pocket. The balls have rolling contact with the raceway, but sliding contact with the surfaces of the retainer. This means that lubriation is necessary.

Most ball bearings used in horizontal motors are grease lubricated although some supplied with vertical motors use oil. Follow the advice of the motor manufacturer in selecting a suitable grease. Carelessness in allowing container to remain open often causes trouble from abrasive dirt. Soda-base soap greases are usually preferred on account of their high melting point and their stability. They mix readily with water, however, and tend to form an emulsion.

Ball bearings in distress can usually be detected by undue heating or by unusual noise. Broken or nicked balls cause rapid destruction of the bearing. They can be detected by the "clicks."

If the conventional 40C. rise above the surrounding air is exceeded, look for an overfilled bearing, since the first result of over-greasing is heating caused by churning of the grease. The general rule is that the housing should not be over half full. Clean the old grease from the bearing and from the housing once a year and repace it with new grease. Average service is assumed.

After the machine is dismantled, the bearing should be carefully wrapped in clean cloth or paper to protect it from outside dirt. Remove all old grease from the housing and clean the housing and the bearing either in Stoddard solvent or in carbon tetrachloride. This is a difficult opera-

tion because particles of grit are not soluble and are removed with difficulty. Remove final residue of cleaning medium with a light oil before filling with new grease. The container with fresh grease must be carefully protected from dirt. Keep the cover on tight. Use a clean, nonmetallic paddle for applying the fresh grease.

Check Air Gap

The air gap in a motor is dependent first on proper maintenance of the bearings and second on the proper alignment of the brackets or pedestals with the frame. Alternating-current motors operate with less gap than direct-current motors, and are therefore more critical. Check the air gap with a feeler gauge at the established schedule period. Make these checks at the pulley end, taking four readings on each motor, 90 degrees apart. For motors below 10 hp., a minimum gap of .005 in. should be maintained. Above 10 hp. the minimum gap should be .010 in.

Couplings Require Parallel Alignment

Where couple type motors are used, the couplings require regular inspection. Faulty alignment in a solid coupling is reflected in bearing trouble and vibration. Make sure that all dowel pins are in correct position and check the faces of the couplings with a feeler gauge after the bolts have been removed. Shift the motor position to make the faces of the two half couplings parallel.

Flexible couplings will operate under more severe misalignment without causing trouble; however, the two halves should be checked with a steel scale to make sure that they are in alignment. Any misalignment means increased wear on the pins, fingers, and leather discs, whichever may be used. Special type flexible couplings should be checked according to the manufacturer's instructions.

Insulation Must Be Clean and Dry

The electrical conductors in a motor are separated from the magnetic circuit and from the mehanical assembly by materials generally grouped under the term "Insulation." Insulation is also used in commutators to separate the bars from each other and in coils to isolate individual turns. It is important that the insulation be maintained so as to function as a separator between the copper coils in the motor and the mechanical assembly. Regardless of the class of insulation used, remember that electrical insulation materials are nonconductors only when clean and dry.

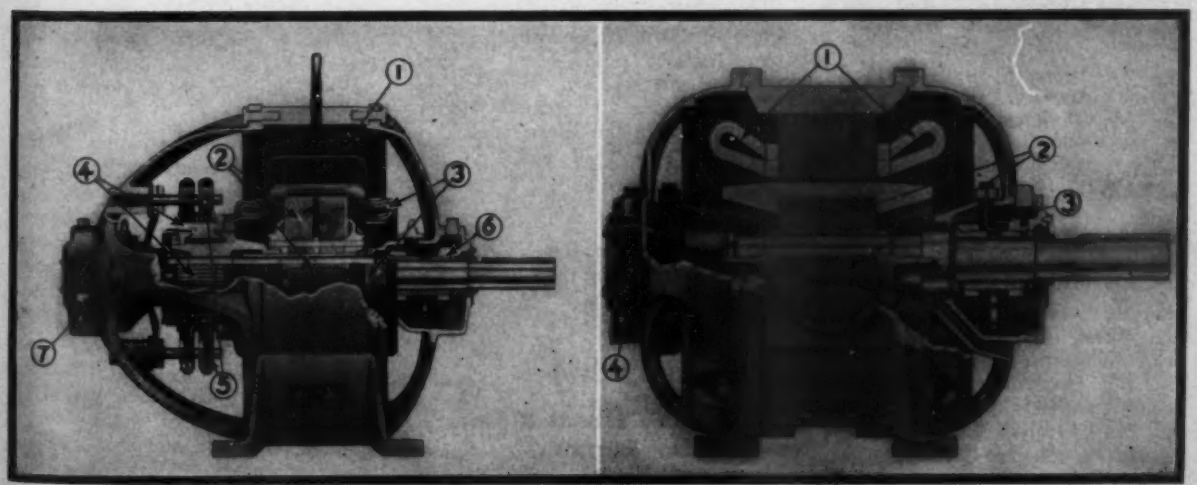
The importance of keeping electrical equipment clean and dry is always worth stressing. Accumulations of dust and dirt not only contribute to insulation breakdown, but they operate to increase the motor temperature through restrictions of ventilation. Dust and dirt is effectively removed with compressed air at about 50 pounds pressure. Do not direct compressed air against the insulation until certain that it is free from moisture that may have accumulated in the air line from condensation. Too great an air pressure may loosen the binding tape or injure the insulation by sand blasting with the abrasive dirt which is nearly always present. It may not be possible to remove all dust and dirt by blowing with compressed air. If the accumulation of dirt contains oil or grease, a solvent will usually be required to remove it.

There are three types of solvents in general use for this purpose. These are petroleum distillates, such as Stoddard solvent or cleaners' naphtha, carbon tetrachloride, and a mixture of the two. The petroleum distillates are the solvents having the least corrosive action on insulation varnishes, and for that reason where conditions permit are preferable to the others. The Stoddard type solvent, produced by all the major oil companies, with a minimum flash point of 100F hr., minimizes the fire hazard, and should be used in preference to gasoline or benzene. Every precaution should be taken however, to prevent fires or explosions.

When this type of solvent will not properly clean the apparatus a mixture of carbon tetrachloride and the solvent may be used. A mixture of 50 per cent carbon tetrachloride and 50 per cent Stoddard solvent is nonflammable, but the vapors mixed with a right proportion of air are explosive. In extreme cases it may be necessary to use straight carbon tetrachloride; however, the toxic effect of this material on the operator must be taken into consideration.

Carbon tetrachloride is more corrosive in its action than petroleum solvents, and it evaporates much more rapidly. For this reason the residue of carbon tetrachloride should be removed by applying a petroleum solvent. This will prevent corrosion later on.

Before any solvent is used, be sure that there is good ventilation and minimum fire risk. Do not let the workers' clothing become saturated with the solvent. Always have fire extinguishers of the carbon tetrachloride type handy. If a hose is used to spray either cleaning solution or varnish, make sure that the nozzle is



LEFT—Cross-sectional view of d-c. motor. (1, field coils; 2, armature; 3, armature coils; 4, commutator; 5, brush rigging; 6, sleeve bearing; 7, oil overflow, and filler plug.) RIGHT—Sectional view of a-c. squirrel cage motor. (1, stator coils; 2, squirrel cage rotor; 3, sleeve bearings; 4, oil overflow and filler plug.)

LEFT—Periodic cleaning prevents dust and dirt from getting into the motor windings. RIGHT—Oiling the motor regularly is essential to the long bearing and shaft life. Too much oil may contaminate the motor windings, causing possible deterioration of the insulation.

grounded. Workmen should be guarded against breathing the fumes of carbon tetrachloride and they should be under the close observation of someone familiar with artificial respiration. Where conditions are very bad, such as in pits, gas masks should be worn.

The time to apply varnish treatment is after the motor has been thoroughly cleaned in solvent. Use a baking varnish recommended by the supplier for the particular conditions encountered. Two dips and bakes may be sufficient for normal conditions, while for extreme conditions of moisture and corrosive gases four dips and bakes may be justified. One or two additional coats of red synthetic enamel may be justified under extreme conditions.

Dry the motor in an oven before dipping in varnish. Electric or steam heat is the safest and most convenient. Make sure that suitable temperature control is provided and that it is effective so as to prevent injury to the insulation. Maximum dry-out temperature is 115 C. Baking temperature for the varnish and length of the baking period will depend on the type of varnish used.

Insulation Testing

Insulation tests are made to determine the condition of the insulation rather than the quality of the insulation. While special conditions may justify dielectric tests, over potential tests, high frequency tests, or dielectric power factor tests, a test to determine the insulation resistance is generally all that is required in maintenance work. Use Class B insulation for motors whose history shows breakdowns resulting from operation at elevated temperatures.

The most convenient way to read insulation resistance is with a Megger. The 500-volt type is generally used. A higher-voltage Megger may damage low voltage insulation. Remember that the readings are valuable only from a comparative standpoint and that they vary greatly with the temperature of the apparatus. A safe general rule is that the insulation resistance should be approximately one megohm for each 1000 volts of operating voltage, with one megohm as a minimum.

Totally Enclosed Motors

Totally enclosed motors, totally fan-cooled motors, and totally enclosed explosion-resisting motors, all have the frames sealed so as to exclude the outside air. They are well protected against the admission of abrasive dirt and metallic particles that shorten the life of insulation in open motors. For these enclosed motors there are two points to observe.

First, see that all exposed joints in the motor frame and brackets are tight. Use a water-resistant grease in the bracket fits, if the motor is dismantled for any reason. This will help to prevent accumulation of water in the bottom of the motor frame.

Second, make sure that the motor is provided with a drain plug or drain pipe at the bottom of the frame so that any accumulated water can be removed before causing trouble.

Direct-Current Motor Repair

Direct-current motors add the commutator and its current-collecting details to the general maintenance problem. The armature is the heart of the direct-current motor. Through it flows the main-line current, and if the machine is overloaded the armature is the first to give evidence of distress.

When dismantling a d-c motor for periodic overhauling the following points should be observed. Do not roll the armature on the floor; a coil may be injured or the steel banding wire may be nicked. Support or lift the armature only by its shaft if possible. Never allow the weight of the armature to rest on the commutator or on the coils. Inspect the coils carefully to see that they are tight and where necessary replace the wedges. Replace any bands that may be loose.

As far as possible duplicate the banding originally furnished by the manufacturer. Do not change the material in the banding wire, the diameter of the banding wire, or the width or position of the band. Increasing the band width may cause heavy currents in the bands sufficient to overheat and melt the solder.

Only experienced workmen should tighten loose commutators. If the commutator bars are tight they will give out a clear bell-like ring when tapped lightly with a small hammer. If the commutator does not ring, but gives out a flat sound when struck the front Vee should be tightened.

The exposed portion of the front mica V ring is normally a catchall for oil and dirt. This section should be cleaned and protected with a layer of surgical tape and twine to prevent flashovers and breakdown to ground. Red synthetic enamel will give a smooth finish, resistant to oil and carbon dust.

Uniform Spring Tension on Brushes

Check the brush rigging carefully. Most brush holders in use today are box type, and the brush holder should be replaced when the inside broached section is worn.

The brushes themselves must fit properly, not so tightly as to stick, and not so loosely as to shift position when running. Make sure that the grade used is correct for the application, using the advice of the manufacturer of the motor. Make sure that the fit of the brush on the commutator extends across the face of the brush.

The spring tension on the brushes should be uniform so as to prevent selective action. The correct pressure will vary with the design of the machine and adjustments should follow the recommendation of the manufacturer. The brushes should be staggered in pairs of arms to prevent grooving of the commutator. Brush shunts should be kept tight and free from excessive corrosion so that current will be uniformly distributed to the brushes. Under bad conditions of corrosive atmosphere the shunts can be protected by dipping in melted paraffin or in synthetic red enamel or by covering with woven cotton tubing.

Resurfacing of the commutator should be done in a lathe, or with a grinding rig. As it is impossible to obtain a true surface with a hand stone, it should be used only as an emergency. Practically all up-to-date d-c machines have undercut mica in the commutators. This undercutting should be kept 1/16 in. deep.

Lubricating Oils for Gearmotors

A gearmotor is a self-contained drive made up of a ball-bearing motor and a speed-reducing gear unit. It is designed to take advantage of the electrical efficiency of the high-speed motor and the transmission efficiency of accurately cut and properly designed gears.

Suggestions already given apply to the motor element of the gearmotor unit. Front and motor bearings are generally grease-lubricated and require the same attention as in standard ball-bearing motors. Rear bearings, gear box bearings, and the gears themselves are almost always a splash-lubricated from the same oily supply reservoir in the lower section of the gear unit. Oil seals at each bearing prevent oil leakage into the motor windings and out along the driving shaft. The precision cut gears demand carefully selected lubricating oils. Use only top-grade oils of the viscosity called for by the manufacturer of the gearmotor. Give full particulars as to type of units and operating conditions.

The areas of contact on gear teeth are relatively small and the pressures produced in transmitting the loads are relatively large. It is essential to provide a film of lubricant of sufficient strength to withstand the localized pressure during the period of contact. The peripheral speed of the gear governs the period of tooth contact and determines the time during which the film must withstand the pressures. When speeds are high, the time is very short, the loads are usually light, and a comparatively light-bodied lubricating oil can be used. When speeds are low and the loads heavy, the contact time is considerably longer and a heavier bodied oil should be used.

See that the oil level marked for each gearmotor unit is maintained. For normal operating conditions, drain the oil reservoir in the lower section of the gear case once a year and refill with new oil.

Proper maintenance, as outlined in the foregoing, is important even in normal times. In these times when our war effort is demanding most of our critical materials, our manufacturing facilities and our manpower, the importance of an adequate maintenance program cannot be overstressed. Such a program will do much toward maintaining peak operating efficiency and making existing critical materials last for the duration.

Why Untrained Job Instructors Fail*

▶▶▶ THE JOB INSTRUCTOR who has not received training in teaching methods usually fails to do a satisfactory job. He is an ineffective teacher, for the following reasons:

1) He teaches his job in the *order* in which *he* performs it. But a new man does not necessarily learn in the same order. It may confuse him. A good instructor knows how to organize the information into the proper learning order.

2) As an experienced worker, the untrained instructor thinks of his work in *bigger units* than the new man can readily grasp. A good instructor knows how to break instructional units of information into the appropriate size for the learner.

3) The untrained instructor neglects to teach the *entire* operation. As a person becomes more expert, some of the knowledge or habits he first learned become automatic or merge with other knowledge or habits. Not realizing this, he teaches only what he sees on the surface and not the submerged operations. He leaves out important connecting links, and fundamental information which he assumes the learner knows.

4) The untrained instructor stresses the things that seem important to him as an experienced operator. He forgets some of the things which can make or break the operation when performed by a beginner.

5) He forgets *why* a thing is done a certain way. By failing to explain the reason why, he can make the job seem dry and uninteresting. This slows up the learning process.

6) The untrained instructor, because he is used to *doing* rather than *teaching*, is apt to become impatient with a learner who fails to learn quickly. Not being familiar with the laws of learning, he is apt to think of the learner as being slow and stupid.

7) The untrained instructor may find it difficult to teach easily as he is not skilled in using the *most appropriate words* to convey his thoughts. He does not understand how to choose words for specific tasks.

8) The untrained instructor may be deficient in a knowledge of *human relations* and hence may antagonize his learner. A good instructor knows how to gain the confidence, good will, and cooperation of the learner.

9) He does not properly prepare himself before instructing. Consequently, when he starts instructing he may not have a clear idea of the exact number of steps in the operation he is teaching nor of the features of each of the steps. He is apt to back track, to forget things he had wanted to say, to get the order mixed up. He may have to stop and look for parts or equipment. He is apt to show hesitancy and to impress the worker as not knowing his job very well.

To be effective, a job instructor needs training in teaching methods. Just as a machine operator must be highly skilled in machine operation to get maximum production from his machine, so must a job instructor be highly skilled in instructional techniques to get the most from his men.

(*) From *Training Employees as Job Instructors*, a publication of Policyholders Service Bureau, Metropolitan Life Insurance Co.

Slidefilms for Foreman Training

LYNE S. METCALFE

From the slidefilm "Big Little Things."

▸▸▸ WHEN A SUPERVISOR or foreman in a pulp or paper mill is advanced by his company, a suitable understudy should be ready to step into his place.

When the foreman or supervisor first contacts a new worker, trained or untrained, there are certain things he can do, and certain ways in which he can do them to help that employee off to a good start—such as encouraging alertness in the matter of plant safety rules.

When a mill desires to improve on its safety program, it is the foreman and supervisor who can help most in training and checking the employees under his supervision.

At a time when the maximum in effective workmanship from each employee is essential, the foreman or supervisor can contribute most by listening to suggestions, also to complaints, from the individual employee and then doing something about them. When all available manpower must be directed to the maximum of productivity, the foreman or supervisor can win the best efforts of his workers, and keep them satisfied by proper handling.

Such objectives are important at all times, but they are many times more important in wartime. While the individual mill may have done an effectual foreman supervisory training job in the past, anything additional that it can do now to improve on its past effort is worth doing.

The *New York Times* commented recently: "Young men with qualities of leadership are now filling officers' training school classes, but the need for them in industry grows more serious. Skilled supervisors are men who know not only some particular branch of production; the more intelligent of them understand labor policies and methods of instruction for new workers, and usually are a factor in personnel problems."

Many of the largest corporations in the country willingly are exchanging ideas and methods to the end that supervision shall be improved. The Carnegie Illinois Steel Company, for instance, has definitely contributed to the solution of the foremanship training problems and is willing that the paper industry shall benefit from its experience. This great production organization, which employs 130,000 people, recently augmented its well established foreman training program (over 5,000 supervisors) with a series of five sound slidefilms (filmstrips). Each of these strips deals with just such employee relations situations as arise in a pulp and paper mill every day. These slidefilms were devised and prepared by the Training Division of the Carnegie Illinois Steel Company for its own private use, and this visual program has been so successful, and so general is its appeal, that the producer, as a contribution to the war production effort generally, has decided to make the series of filmstrips and synchronized records available to any paper industry employer. Each filmstrip and record is the basis for a single foreman meeting or session, and easily fits into and augments any such training program as a mill already may have in operation.

These films deal with *people*—employees and supervisors—not with products or equipment. They are not about the steel business—the theme might as well have been localized in a pulp or paper mill, large or small. Obviously, employee problems in the

From the slidefilm "Safety for Sale." The foreman has an obligation to help the mill safety program.

making of paper are very similar to those in making steel. Types of employees are similar and generally speaking, training methods resemble each other.

Each slidefilm consists of a strip of 35 mm. safety motion picture film on each segment or "frame" of which is a picture. These pictures comprise charts, drawings, and, in this case, specially made photographs setting up a typical situation in a mill; the foreman is shown how to handle the case while the accompanying record tells him what to say and illustrates how it should be said.

There is no preaching or laying down of rules in this material. All is done by suggestion and a picture voice pattern is provided which insures that all foremen and supervisors will handle the problem as the company wants it handled.

Usually, a film and record are scheduled for a single session once a month. On this basis, the set provides a five-month program of training. The recommended procedure for using a slidefilm is as follows:

a) Introduction of the subject by the leader of the meeting.

b) Projection of the picture and the running of the record.

c) General discussion of the subject by the audience, led by the leader of the meeting—citing of personal experiences, and adding to what has been seen and heard.

d) Second running of the film and record.

e) Further discussion.

Attendance at the visual meetings at the Carnegie Illinois plants is never compulsory. Foremen and supervisors are invited to attend, and the records show an almost 100 per cent response. Questionnaires on the subject also have proved that the great majority of the men favor the visual method of training over all others—especially when the visuals are made the basis of open discussion.

In producing the series, the "situation" form of presentation was selected as best suited to do the job without seeming to "preach" at the men. In other words, characters are chosen representing types of foremen and workers which fit right into the average paper mill personnel. They are shown in a logical sequence of scenes while the voices are heard from the record. There is plenty of human interest in these pictures which makes them an interesting show.

Here is a brief review of the series:

Preparing for the Future (66 individual pictures)—This subject shows that a foreman should always select and develop the most qualified understudy in order to put himself in line for promotion. Suggestions are given as to how to accomplish this result.

Foreman and supervising problems are thrown on the picture screen and discussed by foremen.

Safety for Sale (73 pictures)—This slidefilm shows and explains the foreman's responsibilities in the plant or mill safety program and suggests effective ways to remind workers of the need to follow safe practices.

Fair and Cool (67 pictures)—This subject shows the responsibilities of the foreman to and for his workers. Tips for "handling" his workers are included.

Big Little Things (81 pictures)—In this slidefilm the obligation of the foreman to listen to ideas and complaints, and then to act upon them is stressed.

New Men at Home (73 pictures)—The obligation of the foreman to adjust the new worker to the mill and to his job is covered in this slidefilm.

How to Babbitt Without a Mandrel

W. F. Schaphorst, M. E.

▶▶▶ THE BEST WAY to do the babbitting job is to pour the babbitt quickly. Take all the time desired for preparing the molds, and fashion them in such a way that the babbitt can be poured almost instantly. By pouring quickly, all sides of the shaft are heated simultaneously and expansion is the same all over.

The possibility of danger that must be foreseen and overcome is the warping tendency. Warping will occur when the babbitt is poured slowly and on one spot on the shaft. That spot becomes highly heated, expands, and springs the shaft in such a way that the hot spot will be on the convex side. Before the shaft can spring back, the babbitt solidifies and holds the shaft in its bent condition. Sometimes this bend is slight, so slight that the shaft can be turned anyway, due to the clearance allowed, but the bend can usually be "felt" with the hand, because in one position the shaft turns more easily than in any other.

In preparing the shaft for the mold, it is a good plan to burn some oily waste and create an oil soot all around the shaft. This soot serves a double purpose: it provides or tends to provide the necessary clearance, and it is a good insulator against heat. If the soot isn't thick enough, wrap some thin tough paper around the shaft, pulling both ends together and making it perfectly smooth. This will give a "double insulator." Let the ends of the paper overlap one-half to one inch and paste the ends together, allowing sufficient time to dry so that there will be no moisture in the bearing. Or, instead of pasting the ends of the paper together, it may be held in place with a string wrapped around the outside. The string will then form "oil grooves" in the finished bearing. Don't use thick paper; it will create too much clearance.

This method will give a nice, smooth, babbitted job and but little if any scraping will be required.

PAPER SKETCHES

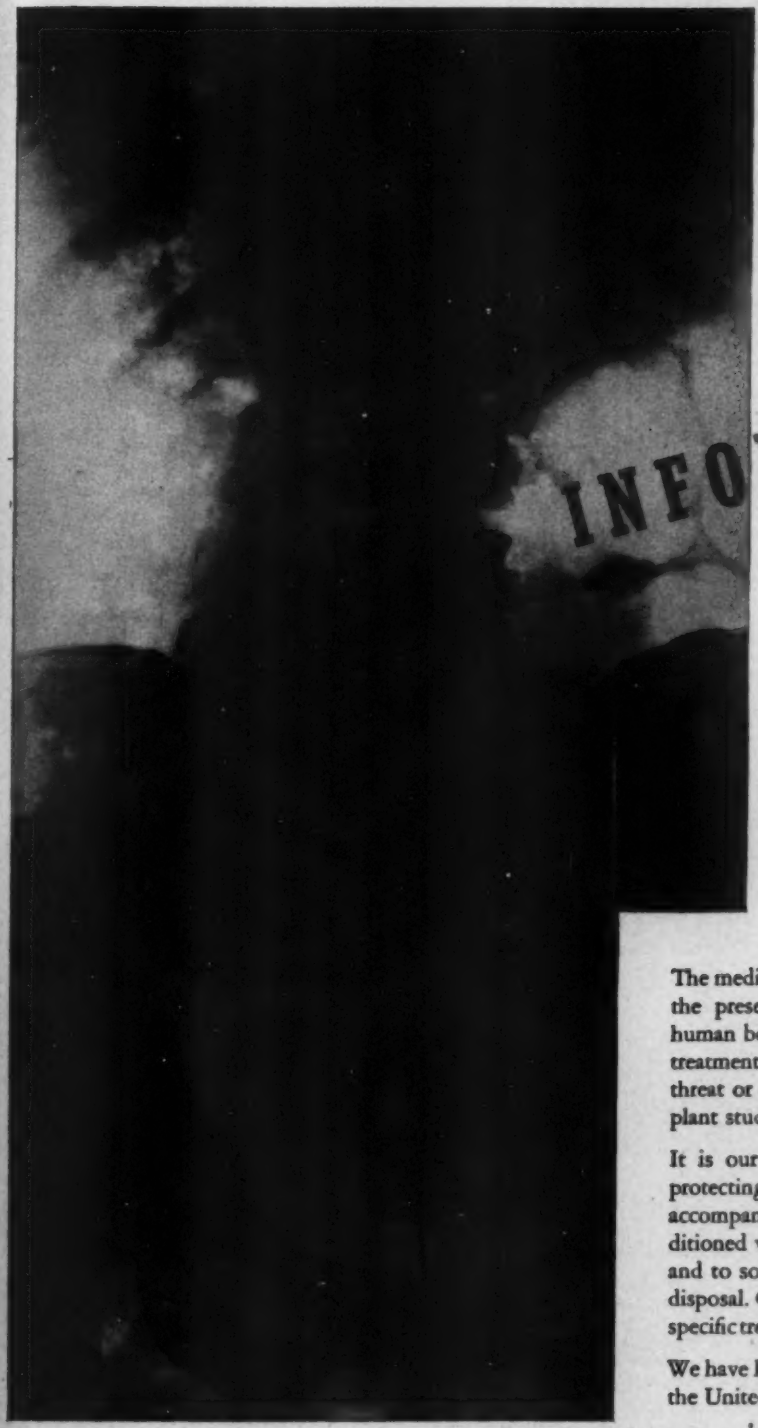
DURING THE EARLY 1800's ENGLISH PAPERMAKING APPRENTICES AND YOUNG JOURNEYMEN OUT OF WORK WERE SENT ON "WALKING TOURS". THEY WERE GIVEN "TRAMPING CARDS" WHICH ENTITLED THEM TO A SMALL WEEKLY PITTANCE AND TO "HALF RATES" AT CERTAIN INNS.

CONTRASTED WITH AN AVERAGE FIGURE OF LESS THAN 40% FOR ALL MANUFACTURING INDUSTRIES, THE UNITED STATES PULP AND PAPER INDUSTRY DEVELOPS NEARLY 70% OF ITS POWER REQUIREMENTS.

AS EARLY AS 1768 BOSTON MERCHANTS ADVERTISED PHILADELPHIA GLAZED PAPER FOR SALE.

TO OBTAIN SUFFICIENT COPPER FOR CASTING IMAGES OF BUDDHA, THE CHINESE GOVERNMENT IN 807 A.D., REQUESTED MERCHANTS TO EXCHANGE COPPER COINS FOR PAPER MONEY.

Turbak



INSIDE INFORMATION

The medical doctor can detect, by means of the X-Ray, the presence of a dangerous condition within the human body. Similarly, in the field of industrial water treatment the Betz organization can determine the threat or existence of a dangerous condition, through plant study and laboratory analyses.

It is our function to assume the responsibility for protecting industry from the many hazards which accompany the use of incorrectly or inadequately conditioned water for boiler, cooling, and process uses—and to solve problems of industrial waste and sewage disposal. Our service is complete for all industries, with specific treatment recommended for each individual case.

We have laboratories and engineers located throughout the United States and Canada.

W. H. & L. D. BETZ

FRANKFORD · PHILADELPHIA · PENNA.

BETZ

CHEMICAL ENGINEERS AND CONSULTANTS ON ALL WATER PROBLEMS

ASSOCIATIONS

HAYWARD SPEAKS ON WOOD SHORTAGE AND LACK OF MANPOWER

"The shortage of wood because of the lack of manpower can and will become critical unless the problem is taken more seriously by manufacturers," said R. A. Hayward, national president of TAPPI, to an audience of over 230 members of Lake States TAPPI and the Northwest Division of the American Pulp and Paper Mill Superintendents Association in a joint spring meeting at Appleton, Wisconsin, on May 22. He predicted such a critical situation as early as the end of this year. The paper industry, he stated, is now operating on its inventories, especially the kraft mills, and the situation is spreading. The Lake States Section has been little affected as yet, but Canadian wood will be off 25 per cent next year, in his opinion.

Mr. Hayward said that supply and production must be brought into balance, and shrinking the demand 4 or 5 per cent can be done with a conservation program. He said that the industry first was affected by a labor shortage when governmental agencies cracked down through an erroneous opinion that the paper industry was not making war sacrifices. Men were taken from the woods and inducted into military service, and it was not until the Pulp and Paper Division of WPB acted that this short sighted policy was curtailed.

The speaker traced the past few years of the paper industry and stated that in his opinion the consumption is about 85 per cent of the operation rate. He said that the nation has an inexhaustible ability to store paper.

Election of officers of the Lake States Section of TAPPI was held, and Dr. T. R. Probst, Gilbert Paper Company, Menasha, was elected chairman to succeed Dr. John Graf, of the Institute of Paper Chemistry. Dr. John P. Weidner, Hoberg Paper Mills, Green Bay, was named vice chairman, and H. P. Dixson, Jr., Fox River Paper Company, Appleton, secretary-treasurer.

Donald McMaster, of Green Bay, was awarded the distinction of presenting the best junior paper before the section during the past year.

The paper industry is warned to take immediate steps to utilize to its fullest extent the remaining manpower and to provide for adequate replacements for men being taken by selective service. This was the consensus of a symposium held during the session. The symposium panel was made up of Dean William H. Spencer, regional director of the War Manpower Commission; Lt. Col. George A. Irvin, selective service registration liaison officer, Chicago; and Robert C. Behn, occupational analyst of the War Manpower Commission.

Dean Spencer said that there are labor deficit and surplus areas, and this situation is being alleviated through the migration and transfer of workers from the surplus areas to the areas of shortage. The principal sources of reserve manpower will be the transfer of workers from less essential or unclassified activities and the use of women not before in industrial work. Unless there is co-operation on the part of employers and the public, he said, national selective service legislation of an industrial type will be necessary.

According to Colonel Irvin, the nation's work force is large enough to provide the needs of selective service plus that of essential industry if it is utilized realistically. The aim of selective service is, he said, "to deliver the number of men at the time and place" demanded by the Commander-in-Chief of the armed forces, and "to perform this task with the least possible dislocation of economic life." He said that a single man who is physically fit and not in uniform by the end of the year will be a rarity. Those in industry instead of the armed forces will be there only because they are being loaned by the Government. Employers who ask for deferment for men with whom they can possibly get along without are unpatriotic, the speaker said.

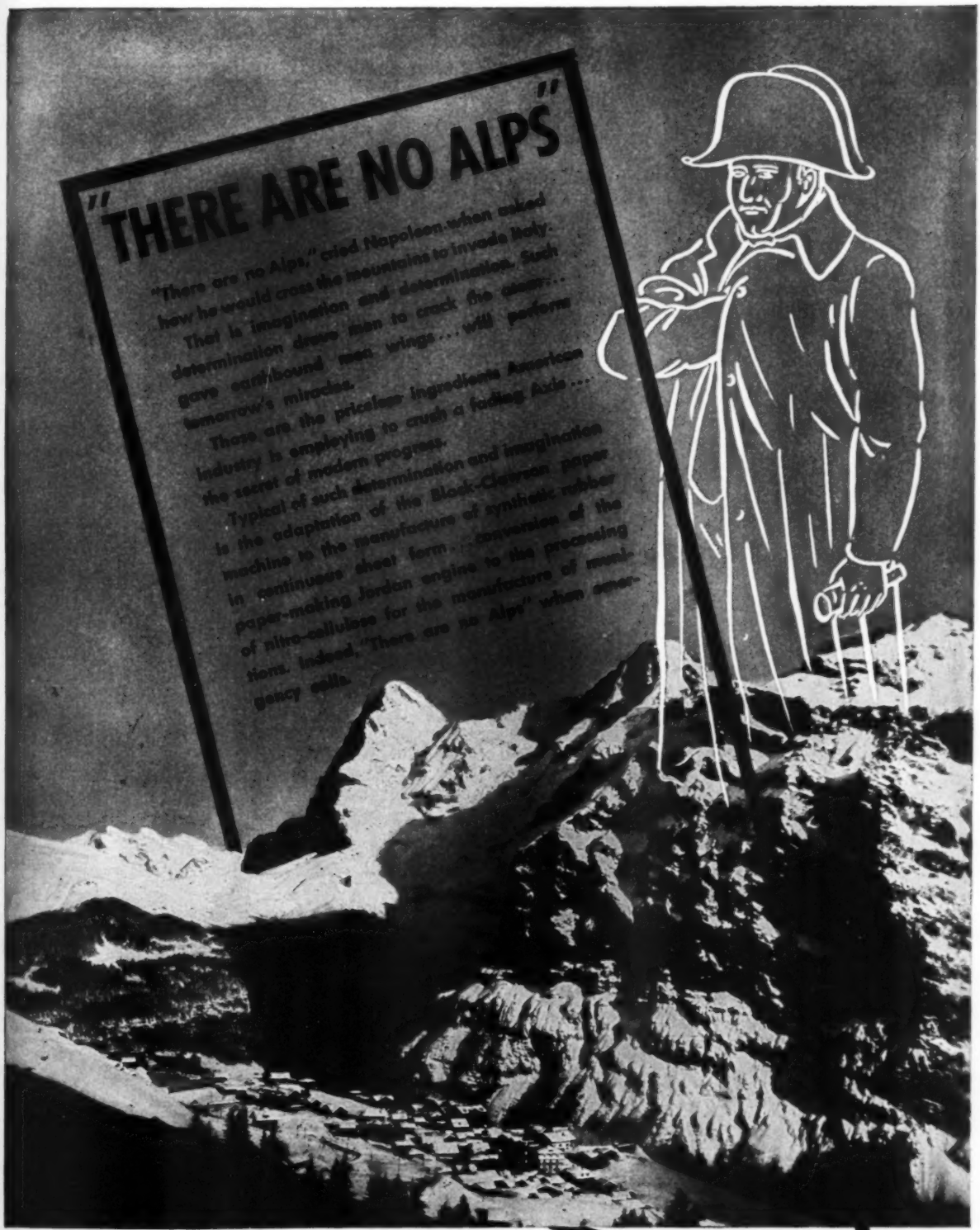
Mr. Behn stated that the manning table replacement plan was the best method of having the least essential men taken first by selective service. He explained that the first step in preparing the table is the understanding and meaning of each job of the company, and the technical skills, training, and experience required to fill certain jobs. In the job analysis, each job's relative value to the plant's productive effort is determined.

View of the speakers table at the banquet meeting held during the joint spring meeting of the Northwest Division of the Superintendents Association and Lake States Section of TAPPI. Left to Right: John Ziemann, chairman Northwest Division, Superintendents Association; Grover Keeth, national president of the Superintendents Association; R. A. Hayward, national president of TAPPI; John Graf, retiring president of Lake States Section TAPPI; W. H. Swanson, a past national president of TAPPI; and Donald MacMaster, of Green Bay, winner of award for best junior paper.

H. H. FISH RESIGNS FROM WASHINGTON OFFICE OF THE APPA

The American Paper and Pulp Association has announced that H. H. Fish has resigned his position with the Washington office, of the Association and returned to the Florida Pulp and Paper Company, Pensacola, Florida. Fred Morrell, who has been connected with the Office of the Secretary of Agriculture for some years, will take over Mr. Fish's duties.

Mr. Morrell ably administered the C.C.C. program for the Department during 1933 to 1942, and since then has been assigned to the procurement of labor for the farmers in the Southeast. He was instrumental in making


"THERE ARE NO ALPS"
"There are no Alps," cried Napoleon when asked how he would cross the mountains to invade Italy. That is imagination and determination. Such determination drove man to crack the atom... gave earthbound men wings... will perform tomorrow's miracles.
These are the priceless ingredients American industry is employing to crush a fading Axis... the secret of modern progress.
Typical of such determination and imagination is the adaptation of the Black-Clawson paper machine to the manufacture of synthetic rubber in continuous sheet form... conversion of the paper-making Jordan engine to the processing of nitro-cellulose for the manufacture of munitions. Indeed, "There are no Alps" when emergency calls.

BLACK-CLAWSON-SHARTLE-DILTS

BLACK-CLAWSON CO., HAMILTON, OHIO

DIVISIONS:

SHARTLE BROS., MIDDLETOWN, OHIO

DILTS MACHINE WORKS, FULTON, N. Y.

ONE LESS "CHORE"

to worry about when you use G-T PACKINGS

. . . because PALMETTO and all of the other G-T Packings stay soft . . . last longer . . . reduce the frequency of repacking.

G-T Packings assure these results because of their *internal* lubrication. These packings are not merely dipped in lubricant after braiding. Their exclusive manufacturing process thoroughly saturates each individual strand with a special lubricant before the strands are braided, plaited or twisted. Moreover, each of the different G-T Packings (see list below) has a special lubricant . . . developed for its particular service . . . and compounded in our own plant.

These are some of the reasons why G-T Packings assure smallest yearly packing cost . . . and why it will pay you to try them.

WRITE FOR LITERATURE

BRAIDED

For rods and shafts; layer over layer construction insures uniformly even bearing surfaces.

TWISTED

For valve stems, each strand a perfect piece of lubricated packing.

GREENE, TWEED & COMPANY

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PALMETTO

for steam, hot water, air. PALCO for water. PELRO for oils. CUTNO for alkalis. SUPERCUTNO (blue asbestos) for acids. KLERO for foods.

SELF-LUBRICATING PACKINGS

arrangements with the governments of the Bahamas and Jamaica for the importation of several thousand laborers into the Southern States, as well as other matters of wartime importance.

The Washington office is located for the present in the Raleigh Hotel, Rooms 304-5, and the outside telephone number is Republic 4497. Members of the Association are invited to use the services of this office in contacting government officials.

◆

MIAMI VALLEY SUPTS. HOLD DINNER MEETING

The Miami Valley Division of the American Pulp and Paper Mill Superintendents Association held a dinner meeting on May 8 at the Manchester Hotel in Middleton, Ohio. Chairman S. R. Olsen presided.

The speaker of the evening was A. S. Anderson, personnel director of the Champion Paper and Fibre Company, Hamilton, Ohio, who chose as his subject "Personnel—Its Functions and Objectives in Labor Relations." He presented a survey of possible postwar conditions as compared to the corresponding period of World War I.

Those present at the meeting were also reminded of the Association's National Convention to be held at the Hotel Commodore in New York City on June 16 and 17, and the Association Vice Chairman H. H. Latimer, of the Champion Paper and Fibre Company, pointed out the highlights on the program.

◆

DOMINANT THEME OF CHEM. EXPOS. TO BE WARTIME ECONOMY

Production for war and the wartime economy in producing for civilian needs will be the dominant note of the 19th Exposition of Chemical Industries to be held at Madison Square Garden, New York City, next December 6 to 11. The show is being held at this new location instead of Grand Central Palace, where shows of past years have been staged, due to the fact that the United States Army has commandeered the exposition floors of the Grand Central Palace.

Several factors, according to Charles F. Roth, manager of the Exposition, were responsible for the decision to hold the Exposition at its scheduled biennial interval next December: The need for new activities for the constructive industry and producers of mill equipment and machinery, now that the war production program has passed the plant expansion stage; the need for replacements, changes, and betterments in industry; and the possibility of substitute products becoming the basis of new industries.

Already the roster of the forthcoming show includes leading representatives of all branches of the chemical industries group, their interests ranging from food processing and medicinals through every conceivable line of production, chemical equipment, to structural materials and their fabrication. Many exhibitors are so deeply immersed in war work that future developments can be only half-revealed. Others are able to reach out for new outlets and are definitely working along new development lines.

◆

CONVENTIONS AND COMING EVENTS

June 15-17—National Convention of the American Pulp and Paper Mill Superintendents Association, Commodore Hotel, New York City.

Oct. 5-7—32nd National Safety Congress and Exposition, Hotel Sherman, Chicago.

Dec. 6-11—19th Exposition of Chemical Industries, Madison Square Garden, New York City.

◆

HUDSON RIVER GROUP OF TAPPI MEETS WHILE TRIAL BLACKOUT IS ON

The Hudson River Group of the Empire State Section of the Technical Association of the Pulp and Paper Industry held a meeting at the Queensbury Hotel, Glens Falls, New York, on May 6. Henry W. Fales, manager of the Marinette Paper Co., presided.

Although the lights were turned out during the session, due to a practice blackout, the speakers, E. G. Amos, assistant secretary of the American Pulp and Paper Association, and L. G. Thompson, Marinette Paper Company, continued their discussion of employee relations and training.

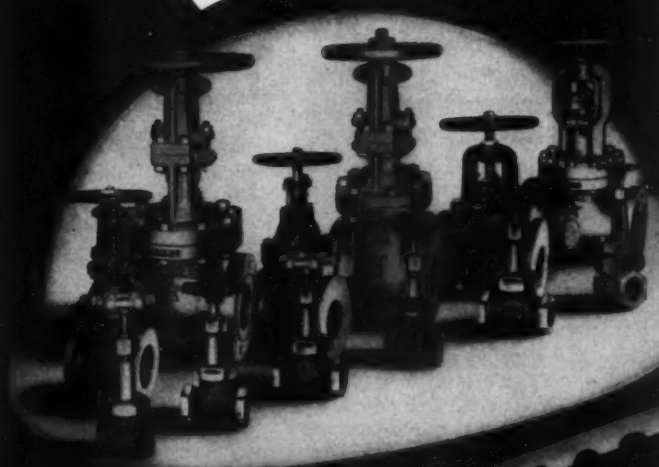
◆

▶▶▶ THE TENTH ANNIVERSARY of the Incandescent Lamp Manufacturers' Association was celebrated at the Hotel McAlpin, New York City, May 7, with an attendance of almost 100 lamp manufacturers and material suppliers. This association of electric bulb manufacturers was organized in 1933 by a group of independents and is the only trade association of the incandescent lamp industry.

◆

▶▶▶ AN ABSENTEEISM SURVEY conducted by the National Association of Manufacturers in 25 of its member company war plants revealed that the wartime average of absenteeism in those companies has increased 56 per cent since the war effort started.

The Supporting Cast in the GREATEST PRODUCTION IN WORLD'S HISTORY



In the colossal job now being accomplished by American industry, every man, every machine, every piece of equipment plays an important part. And every one knows that Industry can give no better performance than the valves which control the fluids or vapors that give Life to Industry. The supporting cast in the greatest production the world has ever seen consists of—Valves. To this role, Powell brings the KNOW-HOW of 97 years of specialization in valve engineering . . . specialization in valve design, function, application, conservation . . . specialization in improvement of workmanship and materials through a period of almost a century. That's why today Powell Valves are giving a faultless performance in the epic drama of American wartime production.

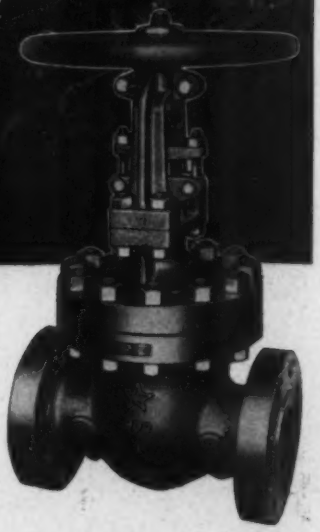


Fig. 9003—Class 900 pound Cast Steel Gate Valve with flanged ends, outside screw rising stem and bolted flanged yoke. Seat and disc are hard faced with Stellite.

THE WM. POWELL COMPANY
CINCINNATI, OHIO

POWELL VALVES

ALLIED

CONTROL OF FITCHBURG DUCK MILLS ACQUIRED BY EDWARD H. HALL

Control of the Fitchburg Duck Mills, Fitchburg, Massachusetts, has been purchased by Edward H. Hall, president and general manager of Fitchburg Screen Plate Company, Inc., and proprietor of Morey Paper Mill Supply Company.

The Morey Paper Mill Supply Company, one of the oldest mill supply houses serving the paper trade, has been in continuous operation for over 50 years and will act as general sales agents for the Fitchburg Duck Mills in the sale of dryer felts; however, the various agencies now handling Fitchburg Duck products will be retained with very few exceptions. It is planned to expand sales immediately to cover the entire country with a wide variety of dryer felts.

◆

A. F. DAVIS GIVES WELDING LIBRARY TO OHIO STATE UNIVERSITY

A new library on welding has been established at The Ohio State University, Columbus, Ohio, by A. F. Davis, vice president and secretary, The Lincoln Electric Company, Cleveland, Ohio. Mr. Davis received the degree of M. E. in Electrical Engineering from the university in 1914, and his reason for placing the library there was the fact that Ohio State has the only four-year course in welding engineering.

Known as the "A. F. Davis Welding Library," it is believed to be the most extensive in existence and of inestimable value in welding development, particularly in the industrial field. Already containing over 700 books, the library is located in the Industrial Engineering Building, which houses the Welding Engineering Department.

◆

DOW CO. ANNOUNCES NEW SERVICE DIVISION

The Dow Chemical Company, Midland, Michigan, has announced the organization of a service and development division for development of new chemical products for America's use now and after the War, and to extend the wartime usage of present products and facilities.

One of the major purposes of this new division is the study and further application of standard and new Dow products to industry in the postwar world, and the company officials believe the new division will grow just as large as industry requires.

Donald K. Ballman

The Dow Company has long been doing such work under several separate divisions, but now its efforts will be co-ordinated and intensified under one head. The new division will have headquarters at the company's main office in Midland and will be staffed by a group of experts who have been chosen for their full technical knowledge of Dow products and specific industries. At the head of this division, the company has appointed D. K. Ballman, whose eight years of product development and technical service work with Dow qualify him for his duties as head of this new division.

◆

▶▶▶ RESEARCH LABORATORIES devoted to the continuing study of synthetic rubber have been established in McGilvery Hall, Kent State University, Kent, Ohio, by The B. F. Goodrich Company, Akron, Ohio, according to Dr. Waldo L. Semon, Goodrich director of synthetic rubber research. The laboratories and staff are under the direction of Dr. Charles F. Fryling, who has been associated with Dr. Semon in research in this field for 6 years.

◆

WINNERS ANNOUNCED IN LINCOLN FOUND. CONTEST

Winners of the current Engineering Undergraduate Award and Scholarship Program of the James F. Lincoln Arc Welding Foundation, Cleveland, Ohio, have been announced.

Herman J. Brenneke, of New York University, New York City, received the first award of $1,000 and the additional honor of having four scholarships of $250 each presented in his name to his university's department of mechanical engineering for his paper entitled, "Arc Welding versus Casting

Howard L. Bevis (center), president of The Ohio State University, examines one of the volumes on welding in the University's new Welding Library. With him are A. F. Davis (left), vice president and secretary of the Lincoln Electric Company and donor of the library; and (right), J. R. Stitt, associate professor, Welding Engineering.

EARNED BY EVERY EMPLOYEE

BY their untiring work the men and women of Rice Barton Corporation have earned the right to fly the Army-Navy "E" over this plant—and to wear the coveted "E" pin.

The "E" pennant is truly a symbol of the vital partnership between our armed forces on land and sea, and our soldiers of production here at home.

To help our country and allies win a decisive victory we realize that whatever has been done today must be but an inspiration for greater deeds tomorrow.

★ ★ ★

For more than a century Rice Barton Corporation have designed and built machines for the making of paper. At present our plant facilities are devoted to work for the Maritime Commission and restricted work for the Navy.

We are looking forward to the day, after this war has been victoriously ended, when we shall again renew contacts with our friends in the paper-making industry.

President

Rice Barton Corporation

Established 1837

Worcester, Massachusetts

When Hell Broke Loose In Tunis

Layne Wells and Pumps were in the thick of things when hell broke loose to crush the Axis troops in Tunis. Only the military authorities could tell of how they came through, but if they were not destroyed by the enemy—or our own terrific fire power, those sturdily built, tough and long lasting Wells and Pumps are still in there pitching—producing millions of gallons of water daily.

The Wells and Pumps in Tunis—and those throughout the African War Zone—Dakar, Algiers, Casablanca, Sousse, Kairouan, etc., were installed by Layne Engineers for peacetime duty, but they had the guts that made them give outstanding war-time service.

Whether for peace or war, Layne Well Water Systems and Pumps stand alone in skilful design, proven superior features, long life and highest efficiency. They are, according to the Layne slogan "Better Built for Better Service."

In the post-war era your Layne Wells and Pumps will be still higher in efficiency—longer in life and of further improved design. In the meantime, the Layne Organization is endeavoring to keep all industrial and municipal installations in repair and operating at peak efficiency. For literature, address, Layne & Bowler, Inc. General Offices, Memphis, Tenn.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. * Layne-Atlantic Co., Norfolk, Va. * Layne-Bowler New England Corp., Boston, Mass. * Layne-Central Co., Memphis, Tenn. * Layne-Northern Co., Mishawaka, Ind. * Layne-Louisiana Co., Lake Charles, La. * Louisiana Well Co., Monroe, La. * Layne-New York Co., New York City * Layne-Northwest Co., Milwaukee, Wis. * Layne-Ohio Co., Columbus, Ohio * Layne-Texas Co., Houston, Texas * Layne-Western Co., Kansas City, Mo. * Layne-Western Co. of Minnesota, Minneapolis, Minn. * International Water Supply Ltd., London, Ontario, Canada.

LAYNE

WELL WATER SYSTEMS

DEEP WELL PUMPS

Builders of Well Water Systems for Every Municipal and Industrial Need

in the Design of Jigs and Fixtures." Robert Edison Lee, of Iowa State College, Ames, Iowa, received the second award, and John H. Stewart of The Ohio State University, Columbus, Ohio, the third award. In all, the Foundation made 77 awards, totaling $5,000, to students representing 33 colleges and universities.

◆

STANDARD OIL XMAS PACKAGES DELIVERED SIX MONTHS LATE

It required six months and more than 13,500 miles of travel, not including a return trip overseas of unknown distance, for a Christmas package sent by Standard Oil Company of Indiana to reach 2nd Lieutenant Albert H. Howerton, formerly an employee at the company's Whiting, Indiana, refinery.

According to a letter of thanks from Lieutenant Howerton, now an engineers' instructor at Jefferson Barracks, Missouri, "The cake cookies, and candy in the package were smashed to powder, and the cigarettes were a little dry and stale, but the non-perishables were in good shape." The non-perishables included shaving cream, razor blades, tooth powder, and a tooth brush. Another complete package has been shipped to him.

The package, one of more than 2,000 sent out by Standard Oil to employees in the armed forces, traveled from New York to Camp Shelby, Mississippi; from Camp Shelby to Fort Ord, California; from Fort Ord to Camp Shelby; from Camp Shelby overseas; from overseas to Camp Shelby; from Camp Shelby to Fort Belvoir, Virginia; from Fort Belvoir to Hammer Field, Fresno, California; and from Hammer Field to Jefferson Barracks.

◆

▶▶▶ FIRST PRIZE in the North American Division of the Seventh Annual IPI Essay Contest was won by Peter Johnson, 17-year-old student at the New York School of Printing. His essay entitled "Printing, a Powerful Weapon of Understanding," was awarded first place in competition with over 5,000 essays entered from all parts of the United States and Canada.

◆

▶▶▶ THE ESSENTIALITY of the printed word was dramatized at a meeting attended by about 1,000 persons in Milwaukee, Wisconsin, on May 10. The meeting was initiated by the Graphic Arts Association of Milwaukee, and co-sponsored by the Milwaukee Advertising Club, Industrial Advertising Club, and Milwaukee-Racine Club of Printing House Craftsmen. The vital importance of the printed word to Victory, democracy, and free enterprise was the theme of the meeting. A large exhibit of printing and advertising gave a convincing demonstration of the ways in which these media are performing indispensable functions in the War and in civilian activities.

Babcock & Wilcox Company, New York City—The Barberton Works of this company has just been awarded the second renewal of the Army-Navy "E" for excellence of production plus a renewal of the Maritime "M" by the Maritime Commission. Two other Babcock & Wilcox plants fly the Army-Navy "E."

Foxboro Company, Foxboro, Massachusetts—The Army-Navy "E" flag was presented to this company by Captain John J. Hyland, U.S.N., at ceremonies held on April 28. E. H. Bristol, president of Foxboro, accepted the award. Major Alex Smith, U.S.A., presented the "E" pins which were accepted by Earl W. Cook. Governor Saltonstall of Massachusetts also participated in the ceremony at which Roy F. Williams, general manager, Associated Industries of Massachusetts, presided.

Improved Paper Machinery Corporation, Nashua, New Hampshire—For maintaining excellence in production, this company has been awarded the Army-Navy "E" pennant.

Rice Barton Corporation, Worcester, Massachusetts—On May 7, in a colorful ceremony at the plant, this company was awarded the Army-Navy "E" pennant for high achievement in war production. The presentation was made by Rear Admiral Wat Tyler Cluverius, U.S.N. (Ret.) and was accepted by George Sumner Barton, president of Rice Barton. "E" lapel insignias were presented by Colonel S. E. Whitesides, Jr., Commanding Officer, Chemical Warfare, Boston, and accepted by J. Wallace Brown. Governor Saltonstall, of Massachusetts, and Mayor Bennet, of Worcester, also took part in the ceremony. Frank C. Smith, Jr., general counsel for the company, acted as master of ceremonies.

"Alltogether dis-fellow box belong kigh-kigh he dry-bone!"

Ask the Marines . . . they know what this means. It's Pidgin English* . . . Solomon Islands talk . . . and it means:

"All these boxes of food are tough!"

They have to be. It takes tough containers to supply a tough army. That's where the "plug" comes in. "Plug" is radio English for "commercial."

Tough, weatherproof corrugated boxes that are acceptable to the Government for specified shipments abroad are being made by the use of Stein-Hall adhesives in which resins are incorporated. So the Stein-Hall Starch Combining Process for manufacturing corrugated board is helping the fight for Victory.

Talk-talk belong me-fellow he-finish – meaning, as you thought . . . "Our story is ended."

*"Pidgin is not 'corrupt' English. Its grammar is simple, but its rules are as firmly fixed as those of the best English" -from MELANESIAN PIDGIN ENGLISH, published by Linguistic Society of America.

If you'd like an original suitable-for-framing print of Brussel-Smith's wood engraving (right) drop a line to Stein, Hall.

The Stein-Hall Process

STEIN, HALL & CO., INC.
285 Madison Ave., New York City

STEIN, HALL MFG. CO.
2841 South Ashland Ave., Chicago

SAFETY

MARINETTE PAPER CO. OPENS SAFETY CAMPAIGN

A rally for all employees opened the safety campaign of the Marinette Paper Company, South Glens Falls, New York. Henry Fales, manager, gave a talk on safety, and D. W. Wilkinson, personnel director of the Scott Paper Company, Chester, Pennsylvania, told of the important part a safe worker plays in industry.

Mr. Fales announced a slogan contest which is open to all employees of the company and their families, with cash prizes to be given for the best entries.

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MINNEAPOLIS-HONEYWELL WINS NSC SAFETY AWARD

Because the Minneapolis-Honeywell Regulator Company, Minneapolis, increased its working personnel during the year 1942, yet showed a lower frequency rate in accidents, the National Safety Council presented that company with its award for distinguished service to safety in its drive to "Save Manpower for Warpower."

The presentation was made by R. L. Forney for the National Safety Council during the Minneapolis-Honeywell radio program "John Freedom" on Wednesday evening, May 19. The Brown Instrument Company, manufacturer of industrial control instruments, is a division of Minneapolis-Honeywell.

◆

SAFETY SCORES

▶▶▶ In the annual paper industry safety contest, eight mills of those participating report perfect scores for April. The mills with a no-accident record are:

Division I—Pulp and Paper Mills
Groups A, B, and C (None)
Group D—

Marathon Paper Mills Co., Ashland, Wis.

American Writing Paper Corp., Holyoke, Mass. (Mt. Tom Div.).

Alton Box Board Co., Carlyle, Ill.

International Paper Co., Riley, Me. (Riley No. 23).

Division II—Paper and Board (Re-manufacturing)

Marathon Paper Mills Co., Wausau, Wis.

Thilmany Pulp & Paper Co., Kaukauna, Wis. (Bag Mill).

South West Box Co., Sand Springs, Okla.

Bay West Paper Co., Green Bay, Wis.

The paper industry safety contest is conducted among member mills of the Paper and Pulp Section of the National Safety Council, and runs for twelve months. The present contest covers the period July 1, 1942, to June 30, 1943.

◆

▶▶▶ THE FIRST PLACE PLAQUE of the Steel Rolling and Fabricating Division of the Greater Chicago Safety Council was awarded to the Riverdale plant of Acme Steel Company, Chicago. C. E. Waddell, safety director of the company, accepted the award on behalf of the 2,350 employees in the rolling mills, machine shops, fabricating and steel strapping departments of the Riverdale plant responsible for the fine safety record.

◆

▶▶▶ CHICAGO RECENTLY RECEIVED the National Safety Council's grand award for 1942 in recognition of the city's reduction of traffic deaths below the average of the preceding three years and for general accident prevention efforts. Col. John Stilwell, of New York, president of the Council, presented the award to Mayor Edward J. Kelly. In accepting the award, Mr. Kelly stated that thus far the city's record for 1943 surpasses that of last year.

CONSTANT TENSION UNWIND ASSURES BETTER REWOUND ROLLS

Cameron Constant Tension Unwind Stands are used at the feed end of roll processing machines such as slitters, winders, coaters and printing presses.

The purpose of this equipment is to maintain a constant tension on the web from the start to the finish of the run regardless of speed changes of the processing machine to which it is attached or of the steadily decreasing diameter of the original roll.

The use of a Cameron Constant Tension Unwind Stand results in rewound rolls of uniform density from the core out, less breaks in rewinding, better starts and in the case of multi-color printing, a marked improvement in lengthwise register.

The Unwind Stand illustrated is type "C" equipped with water-cooled mill roll brakes for high speed operation. Two heavier types, "D" and "E," are built for use with wide, faster running winders also two lighter types "A" and "B." Type A is equipped with air-cooled brakes on the mill roll.

Write for further details today on proper tension for your needs.

CAMERON MACHINE COMPANY
61 POPLAR STREET, BROOKLYN, N. Y. • MIDWEST OFFICE: 111 WEST MONROE STREET, CHICAGO

CAMACHINE

He does MUCH MORE than MAKE them for the paper industry

HE MANUFACTURES more than 2000 types and sizes of chain belts. That is, however, only a part of his business.

His business is mechanical engineering, the design . . . manufacture . . . application . . . selling and maintenance of special apparatus for transmitting power and handling materials.

In order to design and manufacture his chain belts, Rex Mechanical Engineering—Rex M. E.—must perform the functions of application and selling. These are in some ways his most important obligations.

Because of the complexity of modern industry, all engineers must seek and get from each other the extensive and intensive knowledge that only specialization can provide.

Application and selling are the technical information services provided by specialists to help analyze difficulties and find the best ways for surmounting them.

For this service Rex Mechanical Engineering—Rex M. E. —maintains a field organization, most of whom have served their apprenticeships in his drafting rooms and plants. For additional counsel, the territorial men call on specialized designing engineers in Milwaukee who have the advantages of national experience.

Through the work of all of these men in many fields, Rex M. E. is learning—and making available—much that is helpful to machine designers and maintenance engineers in the great work in which all engineers are engaged, namely, to achieve a maximal result at minimal cost and waste.

REX

CHAIN BELTS

In more than 2000 sizes and types

Rex Durobar Chain Belt

Rex H Type Riveted Mill Chain Belt

Rex Roller Chain Belt

Rex Chain Belts which are made in malleable iron are also furnished in Rex Z-Metal, a superior material for cast chain belts. Many other chain belts are made of steel for the heaviest services or highest speeds. There is a Rex chain belt for every drive and conveyor.

For further information, write Chain Belt Company, 1717 West Bruce Street, Milwaukee, Wisconsin.

Rex Chabelco Steel Chain Belt

CHAIN BELT COMPANY OF MILWAUKEE

NAMES *in the* NEWS

Personals

EARL BROWN RETIRES AFTER 29 YEARS WITH BERGSTROM

More than 200 officials and employees of the Bergstrom Paper Company, Neenah, Wisconsin, feted Earl R. Brown, retiring superintendent of the mill, at a dinner held at the Valley Inn on May 1. Mr. Brown is retiring after 29 years of service, having joined the company in October, 1914.

During the program which followed the dinner, Mrs. John Bergstrom read a tribute to Mr. Brown from her husband, president and treasurer of the company. Several other communications from company officials, unable to attend, were also read. Nathan H. Bergstrom, vice president and secretary, presided and presented Mr. Brown with a gold watch on behalf of the company officials. Mr. Brown also received gifts from the office personnel and employees of the company. An informal reception was held for him and Mrs. Brown following the program.

◆

▶▶▶ *W. T. Nichols,* of Westvaco Chlorine Products Company, was elected chairman of the Charleston, West Viriginia, section of the American Institute of Chemical Engineers at its annual business meeting May 27. Mr. Nichols succeeds *Dr. R. L. Sibley* of Monsanto Chemical Company.

◆

HARRY GAY TO DIRECT NEW APPRAISAL SERVICE

The Manufacturers' Appraisal Company, Philadelphia, recently announced a new service to the paper, pulp, and associated industries—a specialized appraisal-engineering service. This new feature is especially interesting to the paper industry field because the announcement further states that this service will be directed by Harry Gay, well known for his years of experience in the design, construction and economics of paper and pulp mills.

The Manufacturers' Appraisal Company states that the services to be performed by Mr. Gay in the use of its property valuations for routine or special purposes will give its clients in the paper and pulp industry an additional report on the manufacturing conditions in their plants, with suggestions for possible improvement of such conditions. This new service will be especially applicable to postwar planning.

It will be recalled that Mr. Gay was associated with the late V. D. Simons, industrial engineer of Chicago, for about 17 years. Prior to that connection he was with Stone & Webster Engineering Corporation, and later carried on a consulting practice in Boston. He was with Blaw Knox Company, as chief engineer of its Power Piping Division in Pittsburgh from 1940 to 1942, and with United Engineers and Constructors, Inc., as staff engineer in the Power Division in 1942-43.

Harry Gay

◆

▶▶▶ At the annual meeting held in New York City on May 21, *Charles Brian,* of Paper Makers Importing Company, Inc., Easton, Pennsylvania, was elected a vice president of the National Council of American Importers.

◆

▶▶▶ The new newsprint administrator for the Wartime Prices and Trade Board of Canada is *Guy E. Hoult,* of Montreal, senior partner in the chartered accountants firm of P. S. Ross and Sons, successor to *R. L. Weldon,* who asked to be relieved from his duties because of ill health. Mr. Weldon will continue to serve the Board voluntarily as in the past, but in the less arduous position of deputy co-ordinator of the pulp and paper administrations.

ELECTION AT NEW HAVEN PULP & BOARD COMPANY

The Board of Directors of the New Haven Pulp and Board Company, New Haven, Connecticut, recently elected William R. Shaffer as chairman of the Board. Mr. Shaffer was formerly president of the company, and his position will be taken over by Joseph S. Miller, formerly vice president and general manager. Henry D. Fisher, secretary-treasurer and plant engineer, was elected vice president and will continue his duties as secretary-treasurer.

William B. Calkins and Julian H. Morgan were re-elected vice president and assistant treasurer respectively. Other officers elected include Walter F. Daley, vice president, and Ellsworth W. Cowles, assistant secretary.

◆

R. R. RIDGWAY WINS THE SCHOELLKOPF MEDAL

The Jacob F. Schoellkopf Medal for 1943 was awarded to Raymond R. Ridgway, associate director of research for Norton Company, Worcester, Massachusetts, at a meeting of the Western New York Section of the American Chemical Society at Niagara Falls, New York, on May 20. The Schoellkopf Medal is awarded annually by the Section, and Mr. Ridgway is its thirteenth recipient.

Mr. Ridgway was born in Morris, Illinois, and was graduated from Massachusetts Institute of Technology in 1920. He has been with Norton Company since 1922, and is one of the outstanding research men in electrochemistry. He has his headquarters at the Chippawa, Ontario, plant of the company.

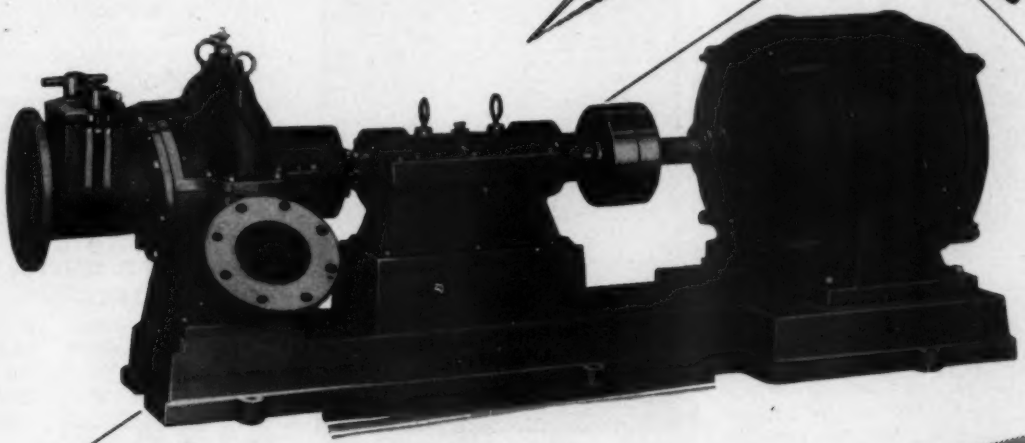
◆

▶▶▶ The appointment of *Howard Kennedy,* M. C., Deputy Adjutant General and Chairman of the Officers Selection and Appraisal Board, National Defense Headquarters, Ottawa, Canada, as Quartermaster General of the Canadian Army with the rank of Major General has been announced. He is a former woods manager of the E. B. Eddy Company, Ltd., Hull, Quebec.

◆

▶▶▶ *Robert R. Zisette* has been appointed general sales manager of S K F Industries, Inc., Philadelphia. He joined the company in 1921, after receiving the degree of mechanical engineer at Yale University. After a year in the engineering and sales de-

ENGINEERED *for emergencies*



and meeting 'em.

• The pumping of paper stock isn't always smooth going—as every mill operator well knows. Those sudden changes in stock consistency can be severe "body blows" to ordinary pumps. *But Buffalo Full Ball-Bearing Pumps are engineered to take 'em.*

These husky pumps are super-built, with special impellers that don't clog. No matter how heavy the stock or how exacting the service, Buffalo Pumps are a long-term guarantee against break downs and delays—the outstandingly economical way to keep production on schedule.

ARMY E NAVY

BUFFALO PUMPS, INC.

213 Mortimer St. Buffalo, N. Y.

Branch Engineering Offices in Principal Cities

CANADA PUMPS, LTD., KITCHENER, ONT.

"Buffalo" PAPER STOCK PUMPS

partments of the company, Mr. Zisette successfully held the positions of sales engineer in the Cleveland office, district manager of the Cincinnati office, and since 1942, assistant sales manager.

◆

I. P. CO. MAKES CULLEN CHAIRMAN OF CORPORATION

R. J. Cullen, president of International Paper Company, New York City, and its predecessors for the past 7 years, was elected to the position of chairman of the corporation, an executive office newly created by the Board of Directors of the company on May 12. Mr. Cullen will have general charge of the business and will formulate the plans and policies of the company. He stated that the tremendous increase in the details of conducting the business of the company made the delegation of some of his executive duties desirable.

John H. Hinman, vice president for the past 15 years, was elected president, and will act as general executive and administrative officer. He has been with International for over 30 years, and has been president of Canadian International Paper Company since December, 1938. Harrison R. Weaver, vice president for the past 7 years and treasurer for the past 12 years, was elected first vice president and treasurer. All other officers were re-elected.

◆

▶▶▶ Abrasive engineer for Norton Company, Worcester, Massachusetts, *Lorin W. Grubbs* has been commissioned a lieutenant (j.g.) in the United States Navy. *Charles A. Babbitt,* who has had experience in the company's research laboratories and in field work, will take over Mr. Grubbs' territory consisting of the states of Virginia, North Carolina, South Carolina, and part of West Virginia and Tennessee.

◆

WILSON RE-ELECTED— OBERMANNS RESIGNS FROM HAMMERMILL

N. W. Wilson was re-elected president of Hammermill Paper Company, Erie, Pennsylvania, at a meeting of the Board held on May 11.

Henry F. Obermanns, who has served for many years as vice president in charge of manufacturing, has resigned because of continued ill health. However, he will continue to be associated with the company as consultant. Other officers of the company were re-elected. D. S. Leslie, vice president, becomes general manager.

H. H. BELCHER NOW ASSOCIATED WITH THE RODNEY HUNT MCH. CO.

Harold H. Belcher has recently joined the Rodney Hunt Machine Company, Orange, Massachusetts, and will take charge of engineering and development work for the Textile Machinery Division.

Mr. Belcher has been actively engaged in machinery design for the textile industry since his graduation from the Massachusetts Institute of Technology in 1925. For the past two years

H. H. Belcher

he has been designing engineer for Proctor and Schwartz, Inc., Philadelphia, and previous to that he was chief engineer and secretary of Philadelphia Drying Machinery Company until this company was combined with Proctor and Schwartz. Mr. Belcher has designed many special machines used in the textile and other industries, and has many patents for new equipment and improvements to his credit.

◆

▶▶▶ A certificate of merit for outstanding educational achievements in transportation was awarded *T. V. Volk,* assistant traffic manager of E. I. du Pont de Nemours & Company, Inc., Wilmington, Delaware, by the Associated Traffic Club of America at the annual meeting of the organization held at the Hotel Du Pont in Wilmington on May 19. Mr. Volk is president of the Traffic Club of that city.

◆

▶▶▶ At the annual meeting of the Purchasing Agents' Association of Chicago, held at the Hotel Sherman, May 13, *Thomas J. Anderson,* purchasing agent of Acme Steel Company, was elected president for the coming year. Mr. Anderson served as second vice president of the group during the past year. He has been with Acme since August, 1918, and will soon complete 25 years of service in the company's purchasing department.

◆

DR. HIBBERT RETIRES FROM McGILL UNIVERSITY

Harold Hibbert, D. Sc., Ph. D., LL. D., E. B. Eddy professor of industrial and cellulose chemistry at McGill University, Montreal, Canada, since 1925, has reached the age limit and is retiring at the end of the present session.

A native of England, Professor Hibbert came to the United States in 1906, then, in 1925, went to Canada to assume his duties at McGill. His researches have been concerned with investigations on the properties of dynamite and other explosives, on the manufacture of pharmaceutical products, and, for the last 15 years, on the chemistry of wood, woodpulp, cellulose and rayon. He is regarded as a world authority on the utilization of forest resources.

◆

LEONARD E. SMITH MADE MGR. OF INTERLAKE MILL

Leonard E. Smith, of Wisconsin Rapids, Wisconsin, has been appointed manager of the Interlake mill of the Consolidated Water Power & Paper Company, Appleton. He succeeds the late C. K. Boyer.

Mr. Smith, who for the last six years has lived in retirement at Wisconsin Rapids, has spent most of his adult life in the pulp and paper industry. He was with the Nekoosa-Edwards Paper Company, Nekoosa, for over 35 years. At the time of leaving the firm in 1937, he held the position of manager of manufacturing.

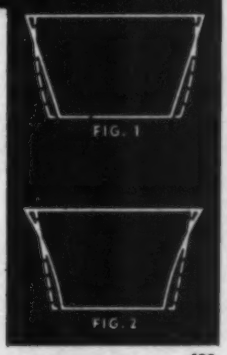
◆

ONTARIO PAPER CO. LOANS D. W. AMBRIDGE TO CAN. GOVERNMENT

Formerly assistant general manager of the Ontario Paper Company, Thorold, Ontario, D. W. Ambridge has been appointed director-general of the shipbuilding branch of the Department of Munitions and Supply. He will act without remuneration, his services having been made available to the Department by Ontario Paper Company.

Mr. Ambridge played an important part in the development of the Baie Comeau newsprint mill by Quebec North Shore Paper Company, a subsidiary of Ontario Paper. He has also been general superintendent of the Anglo-Canadian Paper Mills in Quebec City, and general superintendent of the Anglo-Newfoundland Development Company.

What Happens When a V-Belt Bends



436

Here's *Why* V-Belts with the

CONCAVE SIDE

Give Better Service . . . Longer Wear

If you want longer belt wear and greater efficiency in your V-belt drives, make this simple test:

Take *any* V-Belt that has *straight* sides. Bend that belt as it will bend in going around its pulley. As the belt bends, grip its sides firmly between your fingers and thumb. You will *feel* the sides of the belt *bulge out* —as shown in figure 1 on the right.

Now look at figure 2. There you see what happens when you bend a belt that is built with the patented *concave* side. By building the side *concave*, the bulge has been *taken out* of this belt *to begin with*. When this belt bends, the sides become *perfectly straight* and the shape of the belt *exactly fits* its sheave groove. Two savings result:—

First:—With no outbulge of the sides, the *full width* of the belt *uniformly* grips the sheave-groove wall. This means *uniform wear—longer life!* Second:—Exact fit in the sheave groove gives the belt a *firmer hold* which carries heavier loads without slippage. This again saves belt wear—gives a steadier, more efficient drive operation.

Only V-belts built by Gates are built with the Concave Side, a Gates patent.

THE GATES RUBBER COMPANY

Engineering Offices and Stocks in All Large Industrial Centers

GATES VULCO ROPE DRIVES

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LOS ANGELES, CAL. 2240 East Washington Boulevard
DENVER, COLO. 999 South Broadway
DALLAS, TEXAS 2213 Griffin Street
PORTLAND, ORE. 333 N. W. 5th Avenue
SAN FRANCISCO, CAL. 1090 Bryant Street

ROBINSON RE-ELECTED PRESIDENT OF M AND O

Stockholders have re-elected R.H.M. Robinson president of the Minnesota and Ontario Paper Company, Minneapolis, Minnesota, for the coming year. All directors and officers of the company were likewise re-elected.

Directors and officers of the National Pole and Treating Company, a subsidiary owned 70 per cent by Minnesota and Ontario Paper Company, were also re-elected for the coming year.

Necrology

JOSEPH W. HAYS

Joseph Weller Hays, the first man to be known as a "combustion engineer" and founder of what is now The Hays Corporation, of Michigan City, Indiana, passed away in Grinnell, Iowa, on April 22.

Mr. Hays was born in Chester Township, Paweshiek County, Iowa; attended the nearby country school and later Grinnell College Academy and Cornell College at Mt. Vernon, Iowa, from which he was graduated with a literary degree in 1890. He intended to make journalism his life work, but when he visited the World's Columbian Exposition at Chicago in 1893, the pall of smoke that enveloped the city impressed him so greatly as a preventable waste that he tackled the problem, turning up the "Provident Smokeless Furnace." He assumed the sales agency for it, and thus started a career responsible for saving literally millions of dollars in fuel to American industry.

In 1918, Mr. Hays moved from Chicago to Michigan City, where he conducted an instrument business, besides acting as consultant on combustion problems. In 1925 he decided to devote his entire time to the consulting end, and sold out to Phil T. Sprague, who had been selling instruments for him. At this time the name was changed from The Joseph W. Hays Corporation to The Hays Corporation.

Mr. Hays retired from active consulting practice a few years ago. He is well known as the author of "How to Build Up Furnace Efficiency," now in its 18th edition. In 1941, the Chicago Section of the American Society of Mechanical Engineers presented him with an illuminated scroll for "Public Service in Developing the Science of Fuel Combustion and Fuel Economy and for Promoting Its Study."

Mr. Hays was 75 years old. He is survived by two daughters and one son, Dan F. Hays, an electronic engineer of Independence, Iowa.

◆

▶▶▶ Former treasurer of the Monsanto Chemical Company, St. Louis, Missouri, *Walter R. Phemister* passed away at his home in Hanover, Massachusetts on May 22. Mr. Phemister retired 9 years ago, after having served Monsanto more than 26 years. He was 69 years old. Surviving are his widow, two sons, and a daughter.

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▶▶▶ Senior partner of the Hammond-Goff Company, *Alden M. Hammond* passed away on April 11. In accordance with the partnership agreement, the company will be continued by the surviving partner, Carleton Goff, under the same firm name and at the same address, 26 Custom House Street, Providence, Rhode Island.

◆

EDWARD SOUTHWORTH

Edward Southworth, sales manager, secretary-treasurer, and a director of the Southworth Company of West Springfield, Massachusetts, passed away on May 17.

Born in West Springfield, Mr. Southworth received his education at Kenyon Military Academy and Kenyon College in Gambier, Ohio. Later he was graduated from Cincinnati Law School and practiced law for two years in Cincinnati. He returned to West Springfield in 1913 as sales manager of the Southworth Company, which his grandfather, Edward Southworth, had founded in 1839.

Mr. Southworth was 57 years old. He is survived by his widow, three daughters, and one son.

◆

WILLIAM MORGAN NASH

William Morgan Nash, manager of the Gilbert Nash Company, Menasha, Wisconsin, passed away last month.

Mr. Nash was born in Neenah in 1898, and graduated from Neenah High School in 1917. He attended Marquette University, and for 18 years resided in Chicago where he worked for various paper mills pior to returning to Neenah 5 years ago, when he assumed management of the firm founded by his father, William C. Nash. He revised some of the paper patents of his father and developed some of his own.

Mr. Nash was 44 years of age. He is survived by his widow, a son and daughter, and his father, Wm. C. Nash.

◆

FRANK REID THORN

Frank Reid Thorn, vice president of Price Brothers Sales Corporation, Quebec, passed away on May 6.

Born in London, Ontario, Mr. Thorn became associated with Price Brothers in 1904. He was connected with the lumber department for many years, but when the company went into the manufacture of paper, Mr. Thorn transferred to the sales end. In 1929, Price Brothers Sales Corporation was formed, and Mr. Thorn became vice president, a position he held at the time of his passing.

His widow survives.

◆

C. C. YAWKEY

Cyrus C. Yawkey, chairman of the board of Marathon Paper Mills Company, Rothschild, Wisconsin, and vice president of the Ontonagon Fibre Corporation, Ontonagon, Michigan, passed away at his home in Wausau, Wisconsin, on May 18, at the age of 80 years.

Mr. Yawkey served the paper industry in many capacities during his long business career. He was one of the organizers of Marathon Paper Mills Company, and served as president for many years. He also served as vice president and a director of the Tomahawk Kraft Paper Company, Tomahawk, Wisconsin, and Wausau Paper Mills Company, Brokaw.

His widow and a daughter survive.

GRUENDLER CRAFTSMANSHIP
Employed by U.S.A. in the WAR EFFORT

For a Better Refined PULP

GRUENDLER "TURBO" REFINER

Saves on power up to 50%

Actually Separates, Hydrates, and Combs Fibres—No disintegration and shortening of Fibres with this new method

Let us send you our Laboratory Reports and Bulletin

GRUENDLER
ST. LOUIS, U.S.A.
GRUENDLER CRUSHER & PULVERIZER CO.

From the thinnest tissue to the heaviest board, there is a Hamilton Felt that will do your work better, faster and at lower cost.

Measured by the yardstick of man hours or of steam consumption, by output of tonnage or by quality of product, Hamilton Felts represent the utmost in value. • Once properly installed, Hamilton Felts require the minimum of down time for adjustments. They remove more water at the wet end of the machines, permitting higher speeds and delivering dryer sheets to the drier rolls, with corresponding saving of steam. They give better formation to the sheets, reducing broke and preventing accidental injury to workers. They stand up under hard service long continued.

SHULER & BENNINGHOFEN, HAMILTON, OHIO

• Miami Woolen Mills •

Hamilton Felts

• Established 1858 •

Future Outlook in Pulp-Paper Trade*

W. LeROY NEUBRECH[1] and ARNOLD C. SCHUMACHER[2]

▶▶▶ THE FUTURE HOLDS tremendous opportunities for industry and business. Looking far ahead, however, no single important industry can plan merely in terms of local conditions because eventually the welfare of every business and every person will be influenced more and more by social and economic conditions in the world.

The pulp and paper industry, being one of the Nation's important employers and a producer of products valued at more than 2 billion dollars, is a very important member in the family of industries upon which the economic welfare of the country depends. The industry can do much to achieve a high level of production and employment through careful planning. This will require bold thinking and bold action by each and every pulp producer, paper, paperboard and converted paper products manufacturer and distributor. Assuming 1946 as the first postwar year after the period of reconversion and considering 1941 as the base year, achievement of an 18-per cent increase in the tonnage production of wood pulp and a 36-per cent increase in the output of paper—gains believed to be potentially possible—will depend upon the development of proper attitude and thinking by individual producers and by co-operative attitude of the industry as a whole with respect to over-all policies and its relationships with the Government.

From the industry's point of view there must be, first of all, a clear understanding of the changed conditions that lie ahead. Some of the old world trade markets will be gone but vast new markets in international trade will be opened. New products made of pulp and paper will supplement those already in existence. Improved manufacturing methods induced by wartime innovations will increase efficiency.

These developments all point to increased output, but this will not come about automatically. Several problems must be solved. How will the concentration of labor supply in war production centers affect the postwar labor market? Will new products made of paper, such as fiber cans and boxes, be able to compete successfully with steel and wood products in a peacetime economy? What steps must be taken to create good will and insure lasting and profitable world markets for United States pulp and paper? How will future tax policies affect the cost structure of individual firms in the industry? What will be required in the way of new investment in plant and equipment and replacement of old machinery worn to scrap by peak war production? These are merely a sample of the detailed questions that must be studied, reformulated, and intelligently thought out by those responsible for industry policy and firm management. The purpose of this article is merely to indicate a broad range of various approaches.

Table I—Estimated Production and Imports of Wood Pulp in 1946 at Various Levels of Gross National Product[1]

	1941	1946				
(Levels of gross national product in billions of dollars)	119.20	145.00	150.00	155.00	160.00	165.00
Item		In millions of short tons				
Domestic production	10.20	10.89	11.17	11.44	11.72	12.00
Imports	1.00[2]	3.35	3.43	3.52	3.60	3.68
Apparent domestic consumption[3]	11.20[2]	14.24	14.60	14.96	15.32	15.68

1) Gross National Product includes total expenditures for consumers' goods and services, capital formation by private enterprise, and the product of Government.
2) Estimated; actual figures not available for publication.
3) This figure does not take into account exports of pulp or adjustment for stocks, and, therefore, does not accurately represent consumption. However, these items are relatively insignificant, with exports averaging only 3 per cent of domestic consumption from 1935 to 1941.

The Labor Situation

The pulp and primary paper industry is largely rural, with more than 60 per cent of the mills being located in communities of less than 25,000 population. War production, for the most part concentrated in large metropolitan areas, has tended to attract workers during the war with the lure of higher salaries. This has been particularly true in the Pacific Northwest where the shortage of woods labor has been most acute. Once established in larger cities and having acquired new skills it is unlikely that the majority of these workers will voluntarily return to their former occupations. This situation can have a variety of repercussions. It may mean that pulp producers (and paper producers, perhaps to a lesser extent) may have to offer higher wages to workers. This might well increase the price of pulp. This in turn would tend to stimulate a greater use of pulp in end-products, such as rayons, plastics, and other synthetic materials, of higher value than the traditional paper. Or events may develop entirely differently. If we experience a natural decline in the war industries, not offset by an expansion in peacetime production, a new labor reserve may be created which will be available to pulp and paper producers. The practical steps to be taken by individual firms at the present time in those areas affected by a labor shortage should be a factual survey to discover where labor has gone, whether it is likely to return after the war, and what adjustments in wages, production technique, and personnel relations need to be made.

The postwar labor problem will vary in different sections of the country. Some areas can afford upward wage revisions, without any serious dislocation of markets, while in other regions wage advances would greatly disturb price and cost structures. If forces are set in motion in the postwar world, whether as a result of changed labor conditions or other factors, which inevitably point the way to new centers of pulp and paper production, it will be the responsibility of present producers to discern these trends.

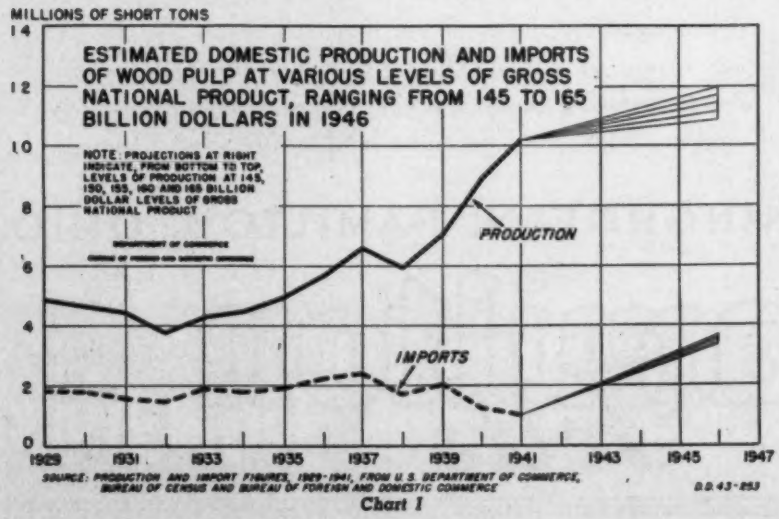


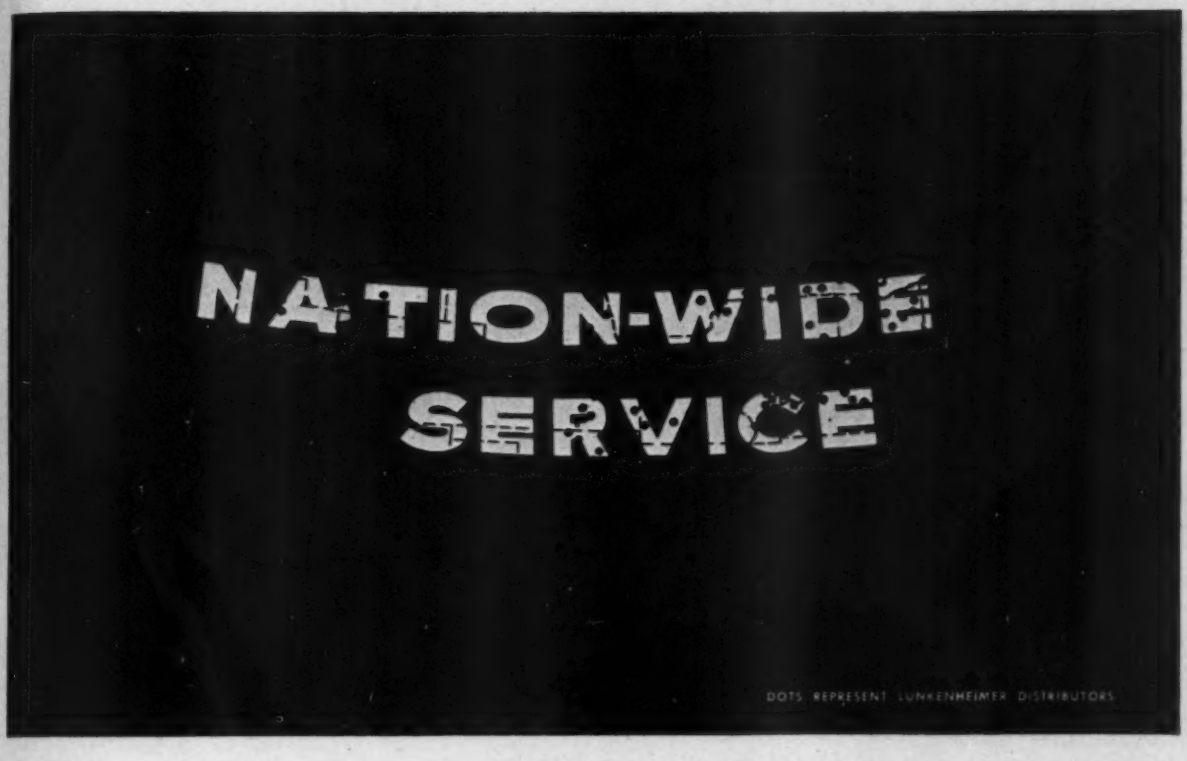
Chart I

Foreign Trade Opportunities

Prior to the War, exports of pulp and paper accounted for a relatively small part

(*) Reprint from June, 1943, issue of *Domestic Commerce*, a publication of the Department of Commerce.

(1) Chief, Pulp and Paper Unit, Division of Industrial Economy; and (2) Assistant Economic Analyst, Pulp and Paper Unit, Division of Industrial Economy, Bureau of Foreign and Domestic Commerce.



Wherever There's WAR ACTIVITY There's a DISTRIBUTOR Serving It...

The distributor is rendering an indispensable service these days. With his complete familiarity with requirements and sources of supply, he is helping hard-pressed procurement offices to obtain vitally needed equipment and supplies for the Army, Navy, Maritime Commission and Air Force...not to mention his services to the thousand-and-one other industries engaged in war work.

He's alive to the needs of the times and his wide experience qualifies him as the logical force to ferret out those needs...he's here, there and everywhere—any hour of the day or night. He knows that he justifies his existence only in the measure that he renders service. Once he receives an order, he is, by the very nature of his business, the best expediter in the world, because his organization is *trained* to get things through in the shortest possible time.

Ask for Catalog 78.

Long ago, Lunkenheimer recognized the distributor as the most efficient and economical means of marketing its products and built up nation-wide distribution through leading supply houses. We salute these distributors for the outstanding job they are doing in helping to speed up war production.

ESTABLISHED 1862

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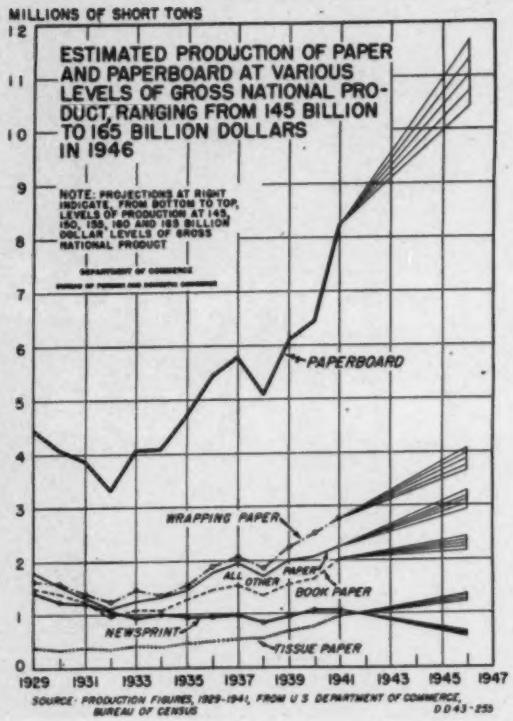
"QUALITY"

CINCINNATI, OHIO, U. S. A.

EXPORT DEPT., 318-322 HUDSON ST., NEW YORK

BRONZE, IRON, STEEL AND CORROSION RESISTANT ALLOY VALVES, 125 TO 2500 LB. S.P.; BOILER MOUNTINGS, LUBRICATING DEVICES, AIRCRAFT FITTINGS

Chart II



of total sales. Pulp exports averaged only 3 per cent of domestic consumption from 1935 to 1941 and exports of paper amounted to about 2 per cent of consumption for the same period. However, during the war period the importing United Nations have become increasingly dependent on United States and Canada for supplies of essential papers, and the trade relations developed under the stress of war will exert a powerful influence in postwar markets. The increased use of paper within a country displays a close relationship to its general cultural and industrial advancement. Books, newspapers, elaborate packaging, and trade activity all require a large volume of paper and are marks of a highly complex civilization. From this rather obvious generalization, it becomes evident that the most expanding markets for paper after the War should be those nations such as China, India, and certain Latin-American republics which anticipate increased industrialization.

Broadly speaking, there are two viewpoints on postwar foreign trade. The first is the use of tariffs to prevent imports into this country of low-priced pulp and paper, thus absorbing the entire domestic market and dumping any excess production in foreign countries, regardless of cost. The second is to promote a doctrine of "quasi-free trade" which will permit imports of wood pulp and paper produced more economically in other countries and encourage exports from the United States of high-priced papers which can compete in the world market on a price and quality basis. Such a program gives the advantage of low prices to both importing and exporting nations and offers a basis for lasting trade relationships.

These are two extreme positions, and a whole range of possibilities lie between these limits. The problem may be too complex to be dealt with in terms of the whole country. For example, it may be more logical and economical for pulp of a particular grade to be imported from Norway and Sweden to paper mills along the eastern seaboard, and the Pacific Northwest pulp producers to serve China rather than transporting western pulp across the continent. Here the cost of transportation is involved. Even if there were only small differences between production costs of European and North American pulps, low ocean freight rates might become a deciding factor in influencing world trade. Then there is the likelihood of certain technical developments during the war making it possible for American pulp or paper manufacturers to produce more economically and perhaps undersell foreign products in world markets. Serious consideration must be given to all these factors in appraising future foreign trade.

Industry Reconversion Problems

A large amount of excess productive capacity and marginal plants characterized the pulp and paper industry prior to the war. Although these facilities have served us well in wartime when demands for all materials are practically insatiable, there is some reason to believe that the problem of an overexpanded industry may again face producers after the War. But such a condition would not mean that particular mills would not have to make capital expenditures. Large firms strategically located will have to expand and replace equipment to meet new markets, while less fortunate plants may have to convert to a different type of production, or cease operations. The high level of activity during the war is enabling many firms to accumulate adequate reserves to make these necessary readjustments.

Probably the greatest expansion will be necessary in the field of converted paper products where a score of new containers and miscellaneous household paper items may result from the War. Several of these new products will require special machinery for mass production. On the other hand, will war-stimulated technical developments result in more pulp and paper becoming fabricated parts or "fusions" in the actual construction of products after the War? Will some new type of paper be used as parts of airplanes? Will pulp wallboards or insulating materials gain a larger share of the construction market? Channels of distribution will have to be set up and paper manufacturers may display keen competition for these new markets. The organizing, financing and initial managing of such new enterprises will require substantial capital expenditures.

Effects of Taxation Policies

All industry after the War must consider the effect of taxes. A recent study made by the National City Bank of New York (see National City Bank Letter, April 1943, p. 45) revealed a 25-per cent decline in net income after taxes in 1942, compared with 1941, for 73 firms in the paper products industry. This decline in net earnings is largely the result of increased taxes, although costs of production in the form of wages and raw materials also rose in 1942.

Taxation has become much more than an instrument for raising revenue. It has become a method of directing social and economic activity. Aside from the huge war debt which must be serviced from taxes in the postwar years, the public may approve a policy of granting tax concessions in some cases and imposing penalties in others in order to channel productive energies in a certain direction. This probably has less implications for the pulp and paper industry than for other enterprises, but the principle of taxation for social control can apply to corporations as well as individuals. It is interesting to note that in this use of taxation the rate may be relatively unimportant. Of greater significance is where the tax is applied, what exemptions are warranted, how the tax is administered, and what type of industrial management is best suited to the tax structure.

Possible Postwar Output Levels

The actual physical production of pulp and paper in a given postwar year cannot

Table II—Estimated Production of Paper and Paperboard in 1946 at Various Levels of Gross National Product[1]

	1941	1946			
	(Actual)				
(Levels of gross national product in billions of dollars)	119.20	145.00	150.00	155.00	160.00	165.00
Item	In millions of short tons					
Total	17.30	21.00	21.62	22.24	22.85	23.47
Paperboard	8.25	10.44	10.75	11.05	11.36	11.67
Newsprint[2]	1.05	.57	.58	.60	.62	.63
Wrapping paper	2.75	3.65	3.76	3.88	3.98	4.08
Book paper	2.02	2.18	2.25	2.31	2.37	2.44
Tissue paper	.96	1.22	1.25	1.29	1.33	1.36
All other paper	2.27	2.94	3.03	3.11	3.19	3.29

1) Gross National Product includes total expenditures for consumers' goods and services, capital formation by private enterprise, and the product of Government.
2) Although domestic newsprint production displays a downward trend at estimated production levels in 1946, this does not necessarily indicate a falling off in consumption of newsprint. From 80 to 85 per cent of all paper imported into the United States is composed of newsprint.

Another reason why

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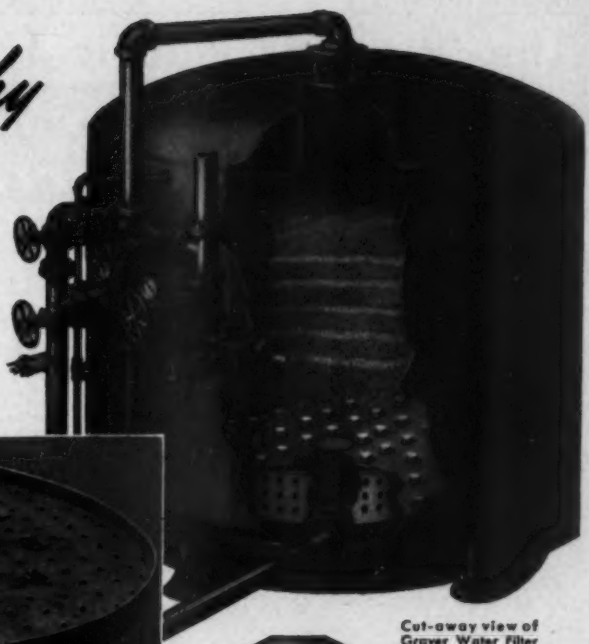
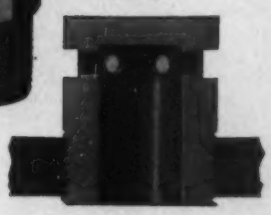
Above—Strainer plate and stainless steel strainers



Cut-away view of Graver Water Filter

Stainless steel strainers showing recessed orifice channel



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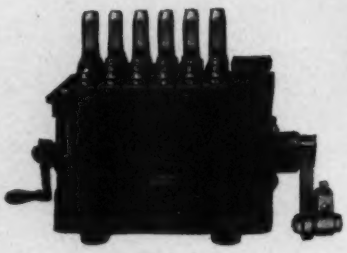

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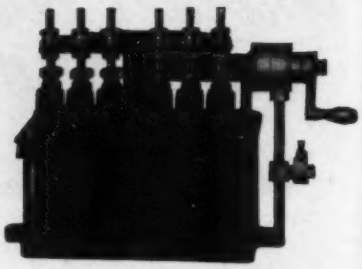

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be ascertained. Activity within the industry will depend largely on the outcome of decisions of the Government and producers regarding the previously mentioned factors. However, on the basis of trends and arbitrary assumptions it is possible to project postwar production statistically. *Markets After the War*, a recent release of the Department of Commerce, presents such a mechanical projection for end-use commodities in a postwar year (1946 was chosen for illustration) in which total gross national product is arbitrarily placed at 165 billions of dollars, *assuming*, "(a) that the War and the immediate postwar reconversion period will be over before 1946; (b) that 96.5 per cent of those seeking employment will have productive jobs; and (c) that prices will be the same as in 1942." Inasmuch as primary paper and pulp are not, for the most part, consumed as end-use commodities they do not appear in these projections.

Using the same techniques employed in arriving at the projections in *Markets After the War*, it is possible to obtain figures of output for pulp and paper in a postwar year. These may be regarded as estimates or not, as the reader chooses. They are not production forecasts.

Projections on Pulp and Paper Output

Chart I and Table I show the estimated production and imports of wood pulp. Chart I depicts possible levels of imports and production of wood pulp in 1946, at various levels of gross national output ranging from 145 to 165 billion dollars, assuming that the immediate postwar period will be over before this date. It must be kept in mind that gross national product, or expenditure, is in dollar values and is influenced by price level changes as well as productivity. Our productive capacity will be greatly enlarged after the war, but if political developments or other factors adversely affect the state of business confidence, causing low prices and unemployment, gross national product may fall below 145 billion dollars. On the other hand, at a high plane of prosperity and at the general price level prevailing in 1942, we may expect a gross national product of 165 billion dollars or more.

The projections of wood pulp imports in 1946 were arrived at by taking the trend in percentage relationship to total production plus imports from 1925 to 1939 and applying this to estimated production plus imports in 1946. The years 1940 and 1941 were not included in establishing this trend, because World War II in these years had interferred with exports of European pulps to the United States. As a result of this interference, domestic production was expanded to meet this nation's needs. Thus, the postwar outlook, assuming a resumption of imports relative to the years before 1939, is for a general leveling off in production and in increased volume of imported pulps.

Production estimates for paper and paperboard are presented in Chart II and Table II. It will be noted that the projections are up for all types of paper, except newsprint. However, since substantial quantities of newsprint are imported from Canada, the actual consumption level is likely to be somewhat higher.

Bold Leadership Essential

The future welfare and progress of the pulp and paper industry will depend upon bold and constructive leadership by individual producers, distributors and foreign traders as well as by the associations representing the various segments of the industry. They must recognize the *new* position of all industry and be willing to act in accordance with *new* precepts. In the years after victory the potential goals set forth in this article will not be achieved merely by making quantitative estimates of postwar markets or merely by expanding productive capacities. Government, labor, agriculture, business, and consumers can accept a new sense of national responsibility in the postwar era and make this nation an outstanding example of a vital living democracy. The pulp and paper industry should accept this challenge and benefit by it.

Booklet Available on Projection Technique

The details of the statistical method employed are available on request from the Pulp and Paper Unit, Bureau of Foreign and Domestic Commerce, Department of Commerce, Washington, D. C. It need only be stated here that a multiple regression equation based on observations from 1929 to 1941 was derived to estimate output in 1946, the postwar year chosen for illustration. Variations of this same technique, as is pointed out in *Markets After the War*, may be applied to the individual firm. The Pulp and Paper Unit will be pleased to assist representatives of firms interested in making such studies.

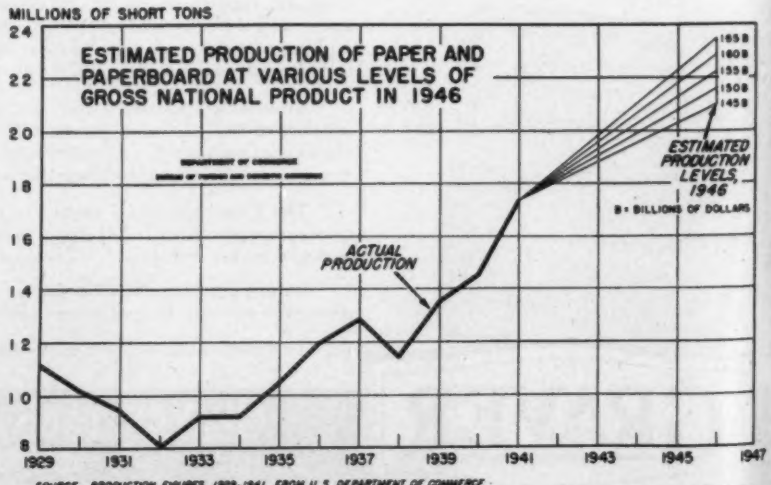

Chart III

Check List OF MONSANTO CHEMICALS FOR PAPER

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ALUMINUM SULFATE

Commercial Grade — Typical Analysis: Total Al_2O_3, 16.2%; Combined Al_2O_3, 15.7%; Basic Al_2O_3, 0.5%; FeO, 0.20%; Insoluble, 5.8%.

AMMONIA, ANHYDROUS

Typical Analysis: NH_3 (mol. wt. — 17.03); residue on evaporation 0.03%; Pyridine — trace; inert gas in liquid phase — none; inert gas over liquid phase — trace.

AMMONIA, AQUA

Commercial Aqua Ammonia supplied 16°, 18°, 20°, 26° Be.

AROCLORS

These plasticizers are chlorinated hydrocarbons varying from water-white mobile liquids and pale yellow viscous oils to light amber resins and opaque crystalline solids. They have desirable qualities as adhesives and are used for impregnating many materials to give resistance to moisture, flame, alkalies and acids and to improve electrical properties. See 20-page book, "The Aroclors."

BENZOIC ACID

U. S. P. and Technical grades. Technical grade: white to yellowish white granules or powder; assay, 99.25% min.; odor, characteristic; solution in 10% Na_2CO_3 (1:6), slightly turbid or opalescent and practically colorless; approx. 10-20% retained on 20 mesh; approx. 100% retained on 100 mesh.

CHLORINE

Clear, amber colored liquid about 1½ times as heavy as water. Conforms with American Water Works Association specifications.

COUMARIN

Fine or large white crystals; melt (liquid), clear and colorless; m.p. 68.8°C. min.; solubility in ethyl alcohol (1:10), complete; loss on drying 0.03% max.; ash 0.05% max.; conforms to N. F. test for acetanilid; 5.0% max. retained on 4 mesh screen; 95.0% min. retained on 8 mesh screen.

DIBUTYL PHTHALATE

Clear, oily liquid; color (APHA) 10 max.; odor, slight; acidity (as phthalic acid) 0.01% max.; sp. g. at 20°/20°C., 1.048 ± 0.001; refrac. index at 25°C., 1.4905 ± .001; assay (ester content) 99% min.; sulfur (copper strip test) negative.

FERRISUL

Anhydrous Ferric Sulfate. Pellets 4-40 mesh. Typical analysis, 90% min. $Fe_2(SO_4)_3$.

MONOAMMONIUM PHOSPHATE

$NH_4H_2PO_4$. Food grade meets all U. S. Pure Food Law requirements. Special grades on request. A white crystalline material, stable in air and soluble in hot and cold water; pH of 1% solution, 4.4.

DIAMMONIUM PHOSPHATE

$(NH_4)_2HPO_4$. Food grades meet all U. S. Pure Food Law requirements. Special grades on request. White crystalline material, stable in air and very soluble in water; pH value of 1% solution, 7.75. At temperatures above 70°C. aqueous solutions lose ammonia readily.

MURIATIC ACID

Supplied in 18° Be., 20° Be., 22° Be. grades. Typical analysis: 18° Be., 27.9% HCl.; 20° Be., 31.5% HCl.; 22° Be., 35.2% HCl.

NITROCELLULOSE SOLUTONS

Made from RS (regular soluble) cotton of any desired viscosity. Viscosity, solid content and solvent composition can be regulated to meet customer requirements.

PHTHALIC ANHYDRIDE

Supplied in three grades with crystallizing points of 131.2°C., 131.0°C. and 130.7°C. White flakes; solution in benzene (1:20) clear; ash 0.03% max. Maleic acid: 131.2°C., 0.10% max; 131.0°C., 0.15% max.; 130.7°C., 0.15% max.

SALT CAKE

Sodium Sulfate. Typical analysis: 94 to 95% Na_2SO_4 available.

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Sodium Sulfite Anhydrous, technical. Tan to slightly pink crystalline powder; assay (Na_2SO_3) 93.0% min.; foreign odor, very faint max.; solution, filtrate from a 10% solution in water not darker than APHA 150 max.

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Sodium Hypochlorite. Standard form; liquid. Typical Analysis: 22° Be., 12% available chlorine by volume.

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Synthetic resins. For information see 40-page book "Plasticizers and Resins."

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Forms are liquid and anhydrous. Typical Analysis of Liquid — 33° Be.: SO_2, 21.5%; Na_2SO_3, 3.0%; Fe, 0.006%. Typical Analysis of Anhydrous: SO_2, 66%; Na_2SO_4, 1.5%; Fe, 0.002%.

SULFURIC ACID

Standard Strengths: 58° Be., 60° Be.; 66° Be.; 98% H_2SO_4; oleums.

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Convention Papers . . . Abridged

Package Problems Confronting Quick-Frozen Food Industry

A. B. BRACKETT, Manager Carton Div. Frosted Foods Sales Corporation

The Birds Eye Company was the pioneer in the field of quick-freezing perishable foods and its method of quick freezing was to package the product in a container and freeze it under pressure between refrigerated metal plates. This necessitated a rectangular package, one that was no thicker than absolutely necessary to produce a commercial package and yet one in which the product could be frozen as quickly as possible.

The package eventually chosen for consumer distribution had standard dimensions of 5 inches by 4 inches for the length and width, and a varying thickness from 1⅛ to 1⅜ inches to accommodate various products. The net contents of these packages varied from 10 ounces to 1 pound. This variation was necessary to provide uniform servings from each package.

A rectangular package not only proved most economical during the quick freezing operation but also conserved vital space during transportation, in low temperature storage warehouse, and in distribution of the products.

The results of all the research work indicated that paper and paperboard offered adequate protection and more possibilities than any other material. Cartons made from firm, clean paperboard, treated to prevent discoloration and softening from the moist products, and wet conditions were considered a satisfactory container. A cold-water wax treatment appeared to be efficient, the least costly, and did not have a tendency to impart a detrimental flavor to the product. The carton in itself did not provide adequate protection to the product during storage, therefore a protective liner for the carton was necessary.

It was found that a liner, to furnish proper protection to the product, must be impervious to water and have a high resistance to the passage of water vapor. Waxed paper liners were the best obtainable in the earlier days of quick freezing but were not as impervious as desired and quick-frozen products could not be satisfactorily kept in storage for long periods of time when in liners of this description.

At the present time, the regenerated cellulose film provides the best commercial material available for this purpose but it is not beyond the realm of possibility for the paper industry to produce a thin, strong, wet-strength sheet of paper that can be coated or treated so that it will have the necessary qualities for protecting quick-frozen foods. Although transparency is a desirable quality, it is not absolutely necessary now that quick-frozen products have been accepted by the public. The cost factor must be seriously considered in connection with this problem. A material for this purpose should have a water vapor transmission rate of not over 0.4 gram per 100 square inches at 100 Fahr. and 95 per cent R. H. or 0.02 gram at 0 Fahr.

Thin transparent rubber-base films were tested when they were first available commercially, but were not considered satisfactory because they were brittle at low temperature and had a very objectionable odor. These objectionable features have since been eliminated and films of this type have been developed that are superior to any other film for protecting quick-frozen foods during low-temperature storage, but unfortunately, these films are restricted for the duration of the war.

A carton overwrap of waxed paper was considered necessary to provide a sanitary and tamperproof package and to provide added protection to the product. It was found that ordinary paraffine waxes would not stay heat-sealed satisfactorily at low temperatures and that it was necessary to add other ingredients to the paraffine wax to obtain a satisfactorily heat-sealed wrapper.

Packages made from paperboard cartons having flexible type of protective liners and waxed paper overwraps could be compressed slightly between refrigerated plates without injuring or detrimentally distorting the packages. This compression feature is necessary to provide good contact between the plates and both surfaces of the product.

In the early days of the quick-frozen food industry, low-temperature transportation and storage warehouses were not efficient nor plentiful. This condition made it necessary for the quick-frozen food packers to provide excessive insulation to their shipping cases so that the product would arrive at its destination in proper condition. A special double-wall corrugated shipping case with two double-wall liners and several pads both in the top and bottom of the case were first used. This condition has changed tremendously and today the equipment and methods of handling quick-frozen products have become so efficient that a regular single-wall corrugated shipping case without pads or liners is perfectly satisfactory.

Tests have indicated that kraft corrugated shipping cases having a water-finished outer liner stand up better under the condensed moisture condition that exists during transportation of quick-frozen foods than any other type. However, jute cases are being used by some packers and might be more commonly used if the outer liners were treated so that they would not become affected by condensed moisture.

Several of the quick-frozen fruits are packed in a syrup which necessitates a rectangular leakproof container. A container of this type offers real packaging problems. Many special types of containers were developed and tested but all had weak points. Eventually a nitrocellulose coated paper was produced that could be heat-sealed and a leakproof bag was first manufactured.

A thermoplastic coating consisting of a rubber and wax combination was successfully developed and tried on vegetable parchment paper but the bond between the coating material and the parchment paper was not satisfactory under the wet conditions nor at the low temperatures that existed. Many types of paper were developed and tested before a satisfactory one was obtained. The most satisfactory sheet was made from a special long-fiber alpha pulp and given a chemical treatment to provide the necessary wet strength and then plasticized to provide the necessary stretchability to withstand the pressure due to freezing expansion. The nature of the surface of this sheet is such that an excellent bond with the coating material was obtained. This thermoplastic coated sheet was used successfully under the adverse conditions that exist until rubber was restricted by the war. The base sheet of paper that proved most satisfactory for making bags for this purpose had a wet bursting strength of approximately 27 per cent of the dry bursting strength. It also had an elongation of 3.5 per cent.

There is still a very good opportunity for the paper industry to develop a paper and a coating to produce satisfactory bags for quick-frozen fruit products. The specifications for a sheet of this type are that it shall have a water vapor transmission rate of not over 1 gram per 100 sq. in. at 100 Fahr. and 95 per cent R. H. or 0.05 gram at 0 Fahr. It shall also heat-seal tightly and stay sealed under wet conditions and at 0 Fahr.; must be plastic enough not to rupture or the coating separate from the paper due to the expansion of the product during freezing; must be free from noticeable odors; must not block at 100 Fahr. and run freely on a bagmaking machine. The paper must have a good coating surface and a sufficient wet strength to stand up satisfactorily under wet conditions.

Some of the new methods of quick-freezing produce a loose-frozen product—that is, one that is quick-frozen before packaging and then packaged after freezing. The packaging problems for a loose-frozen product are somewhat different than for the solidly-frozen product but basically they are the same. Practically all of the loose-frozen products are packed in a bag made

This is the fourth installment of abridgments of papers presented at the annual meeting of the **Technical Association of the Pulp and Paper Industry,** held in New York City, February 15-18, 1943. Monthly installments of these abridgments will appear in succeeding issues.

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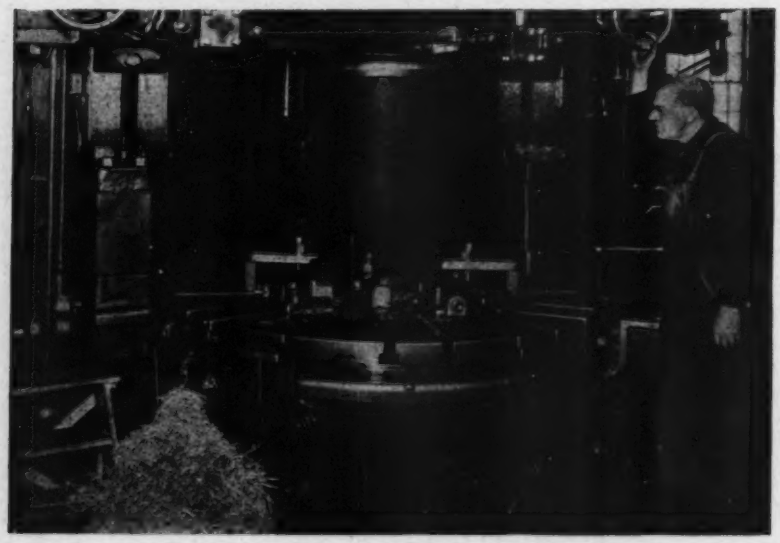
from regenerated cellulose and the bag is placed in an end-opening carton. A fairly large percentage of the 1943 packs of quick-frozen food products will be packaged in this manner. The loose freezing of products is limited to those products that will flow easily and which can be packaged advantageously after freezing. Products such as spinach, broccoli, asparagus, squash, and other similar products cannot be satisfactorily quick-frozen and packaged afterwards.

So far I have only mentioned consumer distribution but quick-frozen perishable foods are used extensively in institutions such as hotels, restaurants, hospitals, trains, boats, and even by the Army and Navy. The packaging problems in connection with the institutional packs were similar to those for the consumer size. After the sizes were determined it was a comparatively simple problem to change the consumer style package so that it would fit into the institutional picture very readily. Most of the institutional packages have a net weight of either 2½ pounds or 5 pounds.

A relatively small percentage of the loose-frozen products are packed in a so-called bulk package which contains approximately 30 pounds or 50 pounds of product. The usual container for this type pack is a corrugated shipping case containing a duplex bag consisting of a laminated glassine inner bag with a kraft outer bag. This container is fairly satisfactory but the paper industry could do much to improve it. Inner bags made from regular laminated glassine have been used commercially by several packers of loose-frozen products, but this type of glassine is more or less affected by moist conditions which make it somewhat undesirable. A wet-strength type of glassine has been developed which has practically overcome this undesirable condition.

Undoubtedly a rectangular package will always be used by the quick-frozen food industry and the ideal or ultimate package might well be transparent and should be made from materials not affected by water or juices or temperatures as low as —30 Fahr. It should be flexible enough to withstand pressure without detrimental distortion; should be closed tightly to prevent leaking or desiccation of the product; and the materials used should be practically impervious to the transmission of moisture vapors. It should be relatively easy to manufacture and be readily handled automatically during production and the ultimate cost should be comparatively low.

Fighters on the WARREN PUMP Production Front . . . No. 1 of a Series



"BIS" MANNED THIS "BATTLE STATION" ALL THROUGH THE LAST WAR, TOO . . .

"Bis" Gould has been a skilled pump maker—at the Warren Steam Pump Company, Inc.—for 40 years. All during World War I, "Bis" operated the same vertical boring mill (shown above), which, today, he is now using to help turn out Warren Pumps needed to help bring the present world tyrants to their knees.

There is no compromise in the quality and skill of Warren workers . . . no compromise in the quality of Warren Pumps. Whether these are used for gruelling 24-hour duty in war plants . . . or for active duty with the United States Navy, Coast Guard, or Merchant Marine, every piece of Warren equipment can be counted on for efficient, reliable, and economical performance.

While Warren production is now largely devoted to vital defense work, we are still in a position to furnish needed repairs in accordance with War Production Board rulings.

WARREN PUMPS

WARREN STEAM PUMP COMPANY, INC.
WARREN, MASSACHUSETTS

Deinking and Use of Old Papers

FREDERIC C. CLARK, Consulting Engineer

The paper industry is today facing a definite shortage in bleached pulps. This shortage is the result of the use of a large tonnage of bleached sulphite pulp in the manufacture of explosives, and because of government curtailment in wood pulp production in order to divert manpower from logging and pulpmaking to more essential war industries. Still further curtailments in pulp production seem imminent. The extent of curtailment is dependent upon war requirements and available manpower. A long war may see still greater quantities of pulp allocated to war needs, and more men taken from pulp and paper mills.

It is estimated that the 1943 cut of pulpwood will be drastically reduced over that of 1942. In 1942, the United States used 17,500,000 cords of wood, including imports of Canadian pulpwood. The estimated available pulpwood supply for 1943 is set at about 14,000,000 cords, or a reduction of approximately 20 per cent. Probably the largest part of this shortage in pulpwood will be reflected in reduced sulphite pulp production.

Our only way of solving the problem of curtailed pulp production is by increasing the use of old papers.

At the present time approximately 35 per cent of all paper and board produced is returned for reuse. It seems reasonable to assume that this 35 per cent could easily be increased to 45 per cent which would be equivalent to adding over 1,500,000 tons of wastepaper to our national stock pile. This in turn is equivalent to adding over 100,000 tons of deinked pulp to the national pulp supply, and over 1,000,000 tons of raw material suitable for board and container uses.

There must be formulated a workable, practical plan by which this large quantity of wastepaper may be regularly collected, sorted, baled, and shipped to the paper mills. In 1938 Loddengaard (Loddengaar P. M., *Tech. Assoc. Papers* 21: 253-358 1938) presented before TAPPI a thor-

oughly constructive discussion of this whole wastepaper collection problem. The suggestions he made then are of even greater importance at this time.

A wide variety of deinking processes have been practiced by the industry, and the literature is full of historical descriptions. Some of these old processes are still in use.

Today two processes are in general use for deinking old papers, each with some modification to suit the preference of the individual mill:

1) Rotary boiler for cooking, followed by means of agitation for complete defibering.

2) Circulating tanks to combine cooking and defibering by rapid agitation of the stock as performed by various devices at a wide range of consistencies to ensure complete defibering.

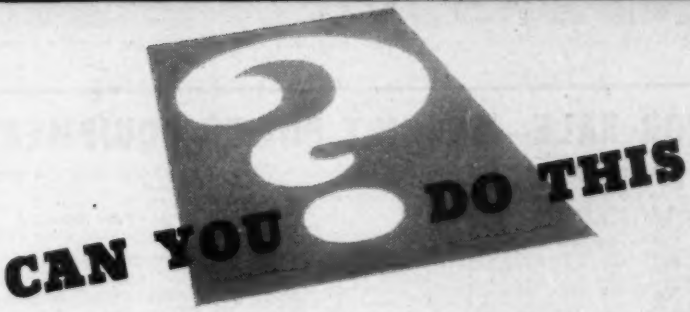
Each process and its modification has its advocates.

Old papers treated in rotary boilers can be handled at very high consistencies, and if the temperature is kept below the boiling point—preferably at 180 Fahr., or less—there is a very low steam consumption and almost no staining of the pulp. The rotary should have plenty of spikes in its shell to ensure the old papers being well agitated during the rotation of the rotary boiler. Steam should be introduced from a perforated pipe running throughout the center length of the boiler so that the old papers are uniformly heated. Four to five hours of rotation should be ample. The contents should then be dumped into a pit filled with an agitator. It is good practice to blow off the bulk of the cooking liquor and save this for reuse.

The pit under the rotary should be partly filled with water before dumping the stock in order that the stock can be pumped from the pit. At this stage all of the old paper should be wet and well softened so that vigorous agitation in a fan pump will give complete defibering. Various devices are used for defibering, such as a high pressure pump discharging against a serrated surface, jordans set with wide clearance, breaker beater and circulating tanks with pumps. The most suitable method is a circulating tank and pump.

In the circulating tank practice there is provided a steel tank holding from 1,000 to 10,000 pounds of old paper at 3 per cent to 5 per cent consistency. The tank has a cone shaped bottom which feeds into a circulating pump and then discharges into the top of the tank. The cooking chemicals are added to this tank with the old papers, and cooking and defibering proceeds at the same time. In some cases the old papers are first softened in breaker beaters, then dumped to the circulating tank. In other cases the shredded old papers are fed directly to the cooking tank until the correct consistency has been reached.

In the circulating tank practice the cooking temperature is always below the boiling point as the cooking tank is vented to the air. In practice the temperature is seldom allowed to go above 180 Fahr. and in the best practice the temperature is kept below 160 Fahr. Temperatures of 140 to 160 Fahr. can be maintained if the chemicals used are effective in loosening and dissolving the binder of the inks. The circulating



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pump used must be of the open impeller type to prevent clogging of the pump, especially when the dry paper is fed into the tank. Any loss in pumping capacity is more than made up by the increased rate at which papers are defibered. The total time in the circulating tank varies from 2 to 5 hours, depending largely on the size of the tank and the circulating pump.

The steps of screening, thickening, washing, and bleaching follow the cooking and defibering stages. Details of these four steps vary somewhat, but in general the defibered stock at ½ per cent to ¾ per cent consistency is first sent over rifflers to remove metal clips and heavy material. It is then sent to screens, preferably of the flat plate type, then to a series of 3 or 4 deckers that washes as it thickens. Dilution occurs after each washing except the last, where bleach solution is added as the thick stock goes to a chest. The amount of bleach solution generally used is so small that there is no need of again washing after bleaching. The pulp is then ready for use in the paper mill.

There is an excessive use of chemicals in some mills in their deinking process. The most common chemical to use is soda ash, and mills vary in its use from 3 per cent to 8 per cent. Some mills prefer caustic soda and its use varies from 2½ per cent to 6 per cent. From long experience it is believed that 3 per cent soda ash is ample. When caustic soda is used alone, not more than 2 per cent should be used. Where papers are hard to deink a combination of 2½ per cent soda ash and ½ per cent caustic soda has proven quite satisfactory.

The cost of deinked old paper stock is generally competitive with soda pulp prices, and superior in quality. Deinked old paper stock requires no additional beating. It helps to close a sheet without excessive use of the jordan and, in general, adds bulk to a sheet. A well operated deinking system will produce a paper pulp of good color and with little or no decrease in strength, when compared with the old papers from which it is made.

Factors Affecting Smoothness of Paperboard

K. C. MELENBACKER
Container Corporation of America

There are two general groups of factors affecting smoothness, internal factors and external factors. Internal factors are those concerned with materials in the paper: the fiber, chemicals, and fiber treatment as it affects fiber structure. External factors are those concerned with the conversion of the original furnish after treatment into a sheet of paperboard. These are the factors of formation, cylinder faces, felts, various kinds of presses, dryers, and calenders. It shall be the purpose of this paper to fit these factors into an overall, interrelated picture which has as its focus, the production of a smooth sheet of paperboard.

A sheet of paperboard starts along its path of manufacture when its components are set forth in a formula or "furnish." In arriving at a proper furnish, the papermaker must have in his mind a picture of the entire manufacturing process. He must be familiar with the properties of the various pulps, pulp substitutes, waste papers, chemicals, and other materials which are available. He must have a fund of knowledge accumulated from past experience, from technical work and analysis, so that he can predict, to a certain extent, results under given conditions. By giving each factor its exact place in the overall picture, he will be able to formulate a furnish with reasonable assurance that the finished sheet will meet specifications.

The effect of controlled stock preparation on smoothness is recognized by all papermakers. Stock preparation is no longer merely a matter of defibering, hydrating, and jordaning. It is a closely controlled step in the manufacturing process. Properly done, it will pay dividends, not only in increased smoothness, but in a general improvement in other characteristics.

Liner stocks must be treated at a given consistency and temperature throughout any individual run and for repeat orders of the same grade. The beating cycle should always be the same, as should any subsequent treatment for further refining or hydrating. Consistency and freeness tests should be made at any step in the process where control is important. These two tests are mentioned because they are the ones in common use. Others can be used depending on particular requirements. At times it may become necessary to vary freeness specifications from established standards because of machine conditions, changes in raw stock quality, or for some other reason. It seldom should be necessary to change consistency specifications.

Sufficient agitation should be provided in all chests so that no consistency variation occurs due to settling or channeling.

Underliners were probably first used in mills where it was necessary to run at least two cylinders of top liner for proper coverage. In such mills it became economically advantageous to substitute a cylinder of liner made of cheap waste papers for a cylinder of expensive top liner. It is doubtful if first considerations went beyond this one idea.

Later on, if the proper attention was given the underliner, it probably became apparent that there was at least one other factor which justified its use—namely, a definite increase in smoothness. This increase in smoothness is due to the fact that a properly blended and prepared underliner achieves superior formation, fills up voids and provides a smooth, closely knit base for the layer of top-liner coming up. In formulating his underliner furnish, the experienced papermaker will bear in mind the requirements of bender, opacity, whiteness, and color uniformity in his selection of waste papers.

In its path from machine chest to forming vat the stock is diluted with water, screened, diluted again and piped to vats where it forms the top components of our sheet of paperboard. It is believed that the mixture of stock and water should be sufficiently mixed and agitated from screen to vat that all fibers are completely separated and not allowed to agglomerate until the cylinder wires take charge.

The formation of a layer of stock on a

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75 KW G.E. CL-6	125 v. 2-brg.		
with 110 HP I-K	3/25/220 ind.		
75 KW G.E. DLC-206A	Intp. 3-brg.		
with 115 HP I-K	3/25/440 ind.		

Motor-Generator Sets

KW	Make	DC Volts	AC Volts
750	Wtg.	275 syn.	3/60/440
150	Ideal	250 ind.	3/60/440
100	Wtg.	250 ind.	3/60/220
100	G.E.	250 ind.	3/60/2200
100	Wtg.	125 ind.	3/60/2300
90	Wtg.	110 Ac gen.	3/60/2300
50	Al. Ch.	110 ind.	3/60/2200
75	G.E.	125 ind.	3/25/440
75	G.E.	250 ind.	3/60/440
75	G.E.	250 syn.	3/60/2200
75	G.E.	125 ind.	3/25/220
75	G.E.	125 syn.	3/60/220
25	Chandrs	125 ind.	3/60/220
22½	G.E.	125 ind.	3/60/220
20	G.E.	220 ind.	3/60/220
15	Ideal	220 ind.	3/60/220
13	Wtg.	60 ind.	3/60/550
12½	G.E.	115/230	3/60/220

PUMPS
Can furnish with motor

GPM	Head	Make	Type
800	325	American	KTNMB
150	90	Gould (2)	#3030
50/100	230	Gould	#1616
150/250		Swaby	#1961
400	100	Haydon	
900	70	Union	19TRP
10/40	120/70	Yeomans (2)	HVS
25/50		Economy	15/20 #
125	180	Jennings	75 #
100		Blackmer	#100
		gasoline pump	

AIR COMPRESSORS

12x10 Chgo. Pn.	N8B 360 CFM	100 #
Ingersoll-Rand	EHI 92 CFM	100 #
Bury, 1230 CFM	30 # class DCB	

Vertical

2—60 HP Wtg. CS		3/60/2200	1750
7½ HP F.M. H		3/60/220	3600
7½ HP G.E. KT		3/60/220	1150
5 HP Wag. (2)		3/60/230	1725
7½ HP Wag. (2)		3/60/220	1725
5 HP Kimble		3/60/440	1200
5 HP Wtg. hb		3/60/220	850

Synchronous

HP	Make	Volts	Type	Speed
300	G.E.	220/440	ATB	720
270	G.E.	440	ATI	600
200	Wtg.	2200		225
190	E.M.	440		720

Frequency Changers

1400 HP G.E. syn. motor 3/60/460 v. 300 RPM 1570 amps. 1250 KVA .9 pf. 50-deg. ATI-24-1250M-300 form C. amort. wdg. 1000 KW G.E. A.C. gen. amort. wdg. .8 p.f. dir-con. exciter.

90 KW G.E. adj. unit. 60 HP 3/60/220 4-speed motor, with comp. pole changing sw. rated 90 KW 60/120 cy. 68 KW 60/90 cy. 70 KW 60/100 cy. 60 KW 60/80 cy.

Rotary Converters

165 KW G.E. type HCC-6-165, comp. wd. intp. 6/60 A.C. 250 v. D.C. 1200 RPM, 440 v. transfs.

50 KW N.W. 3/60/220 1200 RPM A.C. to 115 v. D.C.

2200 volt Compensators. 3 phase, 60 cycle

HP	Make	Type
150	G.E.	NR 4747
150	G.E.	CR 1034-K17
125	Wtg.	A
125	G.E.	CR 1034-K17
75/100	Wtg.	E
100	G.E.	NR 2724
75	Wtg.	E
75 (3)	G.E.	NR 2723
75	G.E.	CR 1034-K17
75	G.E.	NR 2742
60/75	G.E.	NR 6693 N13
60	G.E.	CR 1034-K17
30/50	Wtg.	E
40/50	Wtg.	E (2 of these)
50	G.E.	CR 1034-K17
50	Allis. Chal.	RD-31
40	G.E.	NR5032-N13
30/40	Allis Chal.	RD-31
35/40	F. Morse	CCOB
25	G.E.	NR 2085
60/100	Wtg. autom.	Magnetic (4)

Slipring Control

500 HP G.E. autom. type MTC-209A, 3/60/2200, 9-sec. stg. panel DL128712, Diag. 35069, open.

500 HP G.E. autom. type CR2124, sec. panel, 9-sec. 3/60/2200 v. mine hoist service.

Fire Pump Motors D.C.

75 HP Northwestern 230 v. 1750 RPM.

100 HP G.E. 230 v. 1640 RPM.

Auto Transformers

2—200 KVA G.E. Type HT 4000Y-2300Y.

1—10 KVA Wtg. bal. Cl. 125-250 v.

2—5 KVA Wtg. 80812967 125/250 v.

Transformers

1—125 KVA Kuhlman 1/60 2300/125.

1—100 KVA G.E. 3/60 9000Y/220.

1—90 KVA Kuhlman 1/60 440/1.5-6.

5—75 KVA Wtg. 1/60 2810/244/122.

2—75 KVA Wtg. 1/60 2810/244/122.

1—75 KVA Darling 1/60 10/250.

1—30KVA Kuhlman 3/60 230/55-100.

1—15 KVA Ft. Wayne 1/60 1050-2100/2200-288.

1—10 KVA Moloney 1/60 1100-220/220/440.

1—7½ KVA G.E. 1/60 1100-2300/244/488.

1—7½ KVA G.E. 3/60 2300-4000/230/460.

1—7½ KVA G.E. 2/60 6600Y-230.

1—7½ KVA Pitts. 1/60 2200/110/220.

1—7 KVA Kuhlman 1/60 430-460/1-1.5-2.

1—6 KVA Sorgel 3/60 140/230.

1—6 KVA Kuhlman 1/60 100-5:1.

1—5 KVA G.E. 1/60 1100/2300/220/440.

1—5 KVA G.E. 1/60 1100/2300/110/440.

5—3 KVA G.E. 1/60 460/55-110.

1—3 KVA Moloney 1/60 1150/115-230.

1—3 KVA Moloney 1/30 2200/110-220.

1—1.5 KVA Allis Ch. 1/60 2200/115-230.

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cylinder wire is a purely physical phenomenon, and there are any number of vats designed and built for this purpose. Before the advent of scientifically designed cylinder showers, the fineness of mesh used to cover cylinders was determined at least in part by the extent and rapidity with which they filled up. It is now possible to use faces of a much finer mesh and have less trouble with the wire clogging and filling than was possible some years ago. In general it can be stated that the finer the mesh used, the smoother the finished sheet will be. This assumes that all other factors are equal. If the proper correlation between furnish, stock treatment, and vat eccentricity are worked out, there should be little difficulty in forming a sheet which will have a maximum smoothness as determined by internal factors. The less the surface is deformed by subsequent external factors in the operation, the more effect these internal factors will have on the smoothness of the finished sheet.

Paperboard in the forming process is so soft and plastic that it conforms exactly to the structure of the felts at its top and bottom surfaces. This is the source of the felt mark and is a fixed condition which can only be slightly modified. The effect of the felt mark can be lessened somewhat by the use of finer felts, by installing suction equipment, or by extracting less water at primary presses.

The effect of felt marks may be greatly increased by certain practices which are basically unsound. There may be too much emphasis on low felt costs which prompts the use of coarse felts in attempts to obtain long felt life. Excessive weighting may be employed at primary presses in efforts to remove a maximum amount of water. Such practices may be false economy. It should be remembered that top quality commands top prices.

Correct crowning of all rolls is another external factor affecting smoothness, and when integrated with proper cover density will go a long way toward solving smoothness problems.

The functions of main presses are to remove water and partially eliminate roughness created by primaries. Little more can be said beyond the fact that felts and rolls for these presses should be designed to obtain maximum efficiency. We can pass over drying as having relatively little effect one way or another on the smoothness of the finished sheet. There may be instances where drying must be scientifically controlled, but in the majority of cases this is not true.

Broadly speaking, smoothness will increase as caliper decreases, and conversely, will go down as caliper goes up.

Smoothness trends with changes in caliper will be affected by machine speeds and sheet density. The slower a machine runs, the smoother the finished sheet will be, provided stock preparation is geared to operating conditions. Water drains from a sheet easier at slow speeds than at high speeds. Consequently, stock treatment can be increased, formation will be better and smoothness will be higher. Any increase in sheet density will be accompanied by a corresponding increase in smoothness, all other things remaining constant. These facts are

The Village Smithy stands no longer "under the spreading chestnut tree." He pulls no wheezy bellows, he builds no carryalls. His counterpart presses buttons, manipulates ponderous machinery, works to gird America for war.

His job, your job, our job, has one main motive now — helping to win this war. All of us pulling together will win in the end. We may be obliged to inconvenience one another because Uncle Sam's work has the priority. But we will still do our utmost to serve our respective trades.

DRAPER BROTHERS COMPANY has survived three wars and will surely survive another. Meanwhile we will be tolerant with those who serve us and bespeak tolerance from those we serve. Deliveries may be delayed at times, but quality will never be sacrificed. You can still depend on **DRAPER FELTS.**

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O. J. LELOFF, Vancouver, Wash.

generally recognized and should require no further elaboration.

Vat design has a great influence on the extent to which smoothness changes with caliper. The ideal vat is one which best utilizes and preserves the internal factors affecting smoothness regardless of weight or caliper.

The structure of a sheet of paperboard embodies in it a certain degree of resiliency, one manifestation of which is its effect on smoothness. High-caliper board is more resilient than low-caliper board and because of this, receives less smoothing in the calender nips.

Theoretically, at least, smoothness will go up in some ratio proportional to the number of nips a sheet passes through. Actually the practices followed in this respect are dictated by the available equipment. If a papermaker is having trouble meeting smoothness specifications, should he ask for another stack of calenders or should he ask to have his wet end rebuilt so that he can retain the internal factors affecting smoothness? Should he replace the large rolls in his stacks with a greater number of smaller ones, thus increasing the number of nips through which he can pass his paperboard? Or should he find the solution to his problem in analysis and corrective measures applied to furnish formulas, stock treatment and wet end operation? In most cases it is felt that this latter course is the proper approach.

If we focus our attention on calender-stack operation alone, there are a few points which might well be brought out. The sheet off the dryers should go into the calenders with some moisture in it. Position and number of water boxes can greatly influence smoothness. Steam-heated rolls can sometimes make the difference between an average sheet and an extremely good one, so far as smoothness is concerned. Last, but not least, stacks must be kept in the best possible mechanical condition.

Successful production of alloy steel castings depends upon: (1) a thorough knowledge of the nature of the alloys used, (2) correct design, and (3) extreme care in the preparation of molds, regulation of temperatures, pouring, etc. It is a job for experts . . . men with "know how" . . . because, each step must be handled with extreme care.

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Estimation of Carbonyl Groups in Chromic Anhydride Oxystarch and Oxycellulose by Means of Hydroxylamine

E. K. GLADDING[1] and C. B. PURVES[2]

Although the estimation of the reduction of solutions of copper sulphate (Buton, J. O., and Rasch, R. H., *J. Research Natl. Bur. Standards* 6:603, 1931) (Clibbens, D. A., and Geake, A., *J. Textile Inst.* 15:T27, 1924), potassium ferricyanide (Freiberger, M., *Melliand Textilber.* 11:127, 1930), silver nitrate (Gotze, K., *Melliand Textilber.* 8:624,696, 1927), or ceric sulphate (Forster, A. B., Kaji, S. M., and Venkataraman, K., *J. Soc. Chem. Ind.* 57:T310, 1938) by oxycellulose or oxystarch is very valuable for diagnostic and control purposes, the data give only a qualitative, or at most a semi-quantitative, measure of the carbonyl groups that the oxidized polysaccharides contain. Perhaps the most promising quantitative determination was that proposed by Harris and his collaborators (Martin, A. R., Smith, L., Whistler, A. L., and Harris, M., *J. Research Natl. Bur. Standards* 27:449, 1941; *Am. Dyestuff Reptr.* 30, No. 23:628, 1941) (Rutherford, H. A., Minor, F. W., Martin, A. R., and Harris, M., *J. Research Natl. Bur. Standards* 29:131, 1942), who oxidized the aldehyde groups of periodate oxycellulose to carboxylic acid by means of standard hypoiodite solution. Their modification of Cajori's original procedure (Cajori, F. A., *J. Biol. Chem.* 54:617, 1922) may eventually be found to differentiate aldehyde from the less easily oxidized ketonic groups (Wolfram, M. L., and Lewis, W. L., *J. Am. Chem. Soc.* 50:837, 1928) whose presence in other oxycelluloses must also be assumed. If a method for determining ketone, or aldehyde *plus* ketone (total carbonyl) could be developed it would be possible to follow the oxidation of starch or cellulose in a quantitative way because estimations for carboxylic acid, the other probable stage of oxidation, are now on a fairly satisfactory basis (Elizer, L. H., *Ind. Eng. Chem. Anal. Ed.* 14:635, 1942) (Ludtke, M., *Z. Angew. Chem.* 48:650, 1935) (Sookne, R. M., and Harris, M., *J. Research Natl. Bur. Standards* 26:205, 1941) (Weber, O. H., *J. Prakt. Chem.* 158:33, 1941) (Yackel, E. C., and Kenyon, W. O., *J. Am. Chem. Soc.* 64:121, 1942). The resulting ability to strike a balance between oxidant consumed and oxidation produced would do much to place the study of oxy-

(1) Research Associate and (2) Associate Professor of Organic Chemistry, Massachusetts Institute of Technology.

celluloses and oxystarches upon a secure and fruitful basis.

Bryant and Smith (Bryant, W. M. D., and Smith, D. M., *J. Am. Chem. Soc.* 57:57, 1935), who reviewed the literature, were able to estimate the carbonyl group in glucose by overcoming the difficulties connected with titrating the hydrochloric acid liberated in the highly buffered solution. The present article describes three modifications of their technique, the first of which was designed to estimate the large amounts of carbonyl present in reducing sugars and in polysaccharides oxidized with periodate. The second modification was convenient for following the course of the reaction and the third for determining the smaller amounts of carbonyl present in various oxycelluloses. Finally, the method was tested in a study of cellulose oxidized with various amounts of chromic anhydride dissolved in acetic acid-acetic anhydride or aqueous sulphuric acid. This study paid special attention to the effect of a previous swelling of the cellulose upon the course of the oxidation and to the efficiency with which the oxidant was utilized. The requisite estimations of acidic groups were carried out by Yackel and Kenyon's calcium acetate method (Yackel, E. C., and Kenyon, W. O., *J. Am. Chem. Soc.* 64:121, 1942).

Baker's C. P. analyzed grade of hydroxylamine hydrochloride was suitable but other samples, either older or of less purity, had to be recrystalized by cooling the hot, very concentrated, aqueous solution. (Impure samples gave erratic results.) The indicator used for the titration of the liberated hydrochloric acid was six drops of a standard 0.1 per cent solution of bromphenol blue in alcohol (*p*H 2.8-4.6). Hydroxylamine hydrochloride solutions were made up as needed because they were not quite stable.

Method A. The reagent was prepared by dissolving 10 grams of pure hydroxylamine hydrochloride in water, adjusting the *p*H of the solution to about 5 with 48 ml. of 0.5*N* sodium hydroxide and by making the volume up to 200 ml. with water. Aliquots of 50 ml. were pipetted accurately into 125-ml. glass-stoppered Erlenmeyer flasks containing weighed samples of the reducing sugar, oxycellulose, or oxystarch. These sample weights were chosen so that not more than 60 per cent (0.0036 mol) of the available free hydroxylamine was utilized, because the consumption of a larger percentage rendered the final *p*H of the solution less than 3.5 and the formation of the oxime remained incomplete. The flasks, plus a similar one containing a blank, were kept at room temperature for 1.5 hours in the case of "fast" carbonyls (*see* below) and for 14-16 hours with "slow" ones. Bromphenol blue was then added and the solutions were titrated to the neutral point of the indicator with 0.5*N* hydrochloric acid. Although the solution was highly buffered, the conditions chosen kept the titration error to about 0.1 ml. in an average titration of 6.5 ml.

If x was the sample weight in grams, and y the difference in titer between experiment and blank in milliliters of normal acid, the carbonyl content in moles per gram was given by $y/1000x$.

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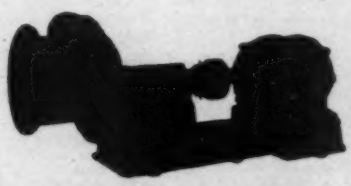

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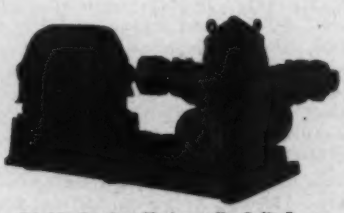

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Method B. Hydroxylamine, hydrochloride, 2.5 grams, was dissolved in 40 ml. of water, bromphenol blue indicator was added and the solution was brought to the neutral point (*p*H 3.5) with a few drops of 0.5*N* NaOH. At zero time, this solution was used to dissolve the sugar sample, whose weight was chosen as in Method A and which was contained in a dry flask. Thereafter, the mixture was momentarily allowed to become acid before it was quickly neutralized with 0.5*N* alkali added from a buret. The total amount of NaOH used after definite intervals of time was noted.

Method C. Each 200 ml. of the hydroxylamine reagent solution contained 10 grams of the pure hydrochloride and not more than 40 ml. of 0.5*N* sodium hydroxide. The sample of oxystarch or oxycellulose, 1.0 to 1.5 grams as a rule, was chosen to contain not more than 0.0015 moles of carbonyl, corresponding to a utilization of 30 per cent of the free hydroxylamine available in 60 ml. of the reagent. This volume was pipetted into the glass-stoppered Erlenmeyer flasks containing the samples, and the mixtures were kept at room temperature for 1.5 hours. Reagent blanks and blanks containing unoxidized cellulose were run. After 1.5 hours, the mixtures were filtered through separate dry Büchner funnels, and 50-ml., aliquots of the filtrates were titrated with 0.1*N* hydrochloric acid. Since the end point to bromphenol blue was insensitive to less than 0.5 ml. of the acid, the titrations were carried out electrometrically to *p*H 3.2 with a Beckman *p*H meter (laboratory model G). Duplicates then checked to 0.1 ml. and usually to 0.05 ml.

This estimation gave the sum of the carbonyl and carboxyl groups when the samples were acidic. In such cases, the 1.0 to 1.5 gram samples and 60 ml. of 0.5*N* aqueous calcium acetate were kept together in a glass-stoppered Erlenmeyer flask for 1.5 hours at room temperature. A dry funnel and flask were used in filtering the mixture, and a 50-ml. aliquot of the filtrate was titrated to a phenolphthalein end point with 0.1*N* sodium hydroxide. The titration, when corrected for the small amount of acid or base used in a calcium acetate blank, corresponded to five-sixths of the carboxylic acid content of the sample (Yackel, E. C., and Kenyon, W. O., *J. Am. Chem. Soc.* 64:121, 1942). Duplicate titrations agreed to 0.1 ml. in a total consumption of 2 to 5 ml. The calcium salt of the sample, retained quantitatively on the Büchner funnel, was thoroughly washed with distilled water before it was submitted to the carbonyl estimation (Method C) which then measured carbonyl groups alone.

The reliability of the hydroxylamine estimation (Method A) for carbonyl was first investigated by means of the sugars listed in Table I and the results ranged from 95 to 103 per cent of theory. It was necessary, however, to use reaction times varying from 1.5 to 18 hours to secure nearly quantitative results with different sugars. The rates at which the latter reacted with excess hydroxylamine were then followed by Method B. When the logarithm of the sugar left uncondensed at any time was plotted against the elapsed time, linear plots characteristic of first order reactions with respect to the sugars were obtained. These plots had slopes that could be classified into two broad groups, the first of which pertained to sugars that reacted completely within 1.5 hours, while sugars corresponding to the second group required a longer time. If the assumption be made that condensation occurred only with the open chain, aldehydo modifications of the aldoses, the data suggest that the pyranose ⇄ furanose ⇄ aldehydo equilibria were much more labile in xylose, mannose, and galactose than in cellobiose, lactose, and glucose. The sluggish behavior of fructose, in which conversion to the open-chain form is particularly easy, may be attributed to the fact that fructose is a keto, not an aldo sugar.

TABLE I.—Determination of the Carbonyl Content of Sugars with Hydroxylamine

Sugar	Grams of sugar taken	Moles. of carbonyl taken	Moles. of carbonyl found	Per cent carbonyl found
"Fast" carbonyls, time of reaction = 1.5 hours				
mannose	0.611	0.00340	0.00342	100
mannose	0.611	0.00340	0.00338	99
galactose	0.618	0.00343	0.00340	99
galactose	0.610	0.00338	0.00329	98
galactose	0.620	0.00344	0.00332	97
xylose	0.611	0.00407	0.00404	99
xylose	0.559	0.00372	0.00362	98
arabinose	0.512	0.00341	0.00327	96
arabinose	0.514	0.00342	0.00321	95
"Slow" carbonyls, time of reaction = 10-18 hours				
glucose	0.495	0.00275	0.00279	100
fructose	0.613	0.00340	0.00350	103
fructose	0.613	0.00340	0.00321	95
fructose	0.613	0.00340	0.00318	94
lactose	1.206	0.00352	0.00350	100
cellobiose	1.157	0.00338	0.00319	94
cellobiose	1.132	0.00332	0.00314	95

Table II contains data on starch and cellulose oxidized with known amounts of periodate (Column 1) to products in which the glycol unit in the second and third positions of the glucose residues was replaced by two aldehyde groups (Jackson, E. H., and Hudson, C. S., *J. Am. Chem. Soc.* 59:2049, 1937; *J. Am. Chem. Soc.* 60:989, 1938). Analysis of these products by the glyoxal tetramethyl acetal method (Grangaard, D. H., Gladding, E. I., and Purves, C. B., *Paper Trade J.* 115:41, 1942) (Column 4) and for carbonyl groups by hydroxylamine (Columns 2 and 3) gave results that differed by not more than 7 per cent. This agreement was considered satisfactory because the former values may be four or five per cent high. Another check upon the validity of the hydroxylamine titration was found in the satisfactory nitrogen analyses of the dioximes of the periodate oxycellulose (Table II).

Chromic anhydride oxycelluloses were examined by the hydroxylamine Method C and an initial rapid reaction, which was complete in 1.5 to 2 hours, was followed by a slow one. Although "slow" carbonyl groups were possibly responsible for this secondary reaction, the point was not proved, because the decrease in titer of the hydroxylamine blanks proceeded at approximately the same rate. Unoxidized, swollen cellulose, however, appeared to be an anticatalyst for the later stages of the decomposition of the reagent, and this variable effect made the proper blanks for oxycellulose experiments uncertain. This difficulty was not apparent when the reaction time was limited to 1.5 hours, as is shown by comparison between the following pairs of reagent and unoxidized cellulose blanks: 45.8, 45.7; 44.15, 44.15; 45.3, 45.3; 44.25, 44.3; 43.1, 43.0 ml. of 0.1*N* hydrochloric acid. These data also show that the swollen unoxidized cellulose contained a negligible number of carbonyl groups. A reaction time of 1.5 hours was adopted in subsequent experiments, because the results could be interpreted definitely in terms of the carbonyl groups.

The use of chromic anhydride in acid solution naturally produced oxycelluloses containing free carboxylic acid groups that bound additional quantities of hydroxylamine as a salt during the carbonyl estimation. Correct carbonyl values were readily obtained by using the neutral calcium salt of the oxycellulose, which was incidentally prepared when determining the carboxylic acid content by the calcium acetate method (Yackel, E. C., and Kenyon, W. O., *J. Am.*

TABLE II.—Carbonyl Content of Periodate Oxystarch and Oxycellulose

Sample number	Moles. of oxidant consumed per gram	Moles. of carbonyl found per gram	Per cent of oxidant as C = O (a)	Percent of oxidant found by glyoxal analysis (b)
Oxystarch:				
8-1	0.00532	0.0101	95	96
Oxycellulose:				
49-1	0.00234	0.00440	94	98
62-2	0.00442	0.00823	93	98 (c)
62-2	0.00442	0.00823	93	98
62-2	0.00442	0.00804	91	98
37-1	0.00470	0.00892	95	.. (d)
37-1	0.00470	0.00864	92	..

(a) Based on reaction: 1 atom O → 2 Moles. C = O.
(b) See reference (*14*).
(c) Nitrogen content of oxime: Calculated N = 10.6%
Found N = 10.4, 10.6%
(d) Nitrogen content of oxime: Calculated N = 11.5%
Found N = 11.2, 11.8%

Chem. Soc. 64:121, 1942). The data show that the sum of the carboxyl and the carbonyl groups was always within 4 per cent of the total hydroxylamine combined by the acidic form of the oxycellulose. Hydroxylammonium salt formation was therefore practically quantitative, and thus interposed no difficulty in the carbonyl estimation.

Starch, when oxidized with chromic anhydride in 0.2*M* sulphuric acid at 20 C. to the equivalent of 0.300 atoms of oxygen, gave an oxystarch containing 0.081 and 0.0585 moles, respectively, of carbonyl and carboxyl groups. Since the corresponding figures for swollen cellulose were 0.075 and 0.0495 moles, the behavior of the starch was in no way abnormal. The failure of starch to be oxidized at all by the chromic anhydrideacetic acid-acetic anhydride mixtures was accordingly unexpected and was attributed to the failure of the reagents to penetrate beyond the minute surface of the powdered but unswollen starch granule.

The general conclusion was that substantially all of the oxidant up to 0.2 atoms of oxygen per glucose unit was represented by the oxycellulose, but that not more than 75 per cent was accounted for as carbonyl and carboxyl groups.

Although it is premature to speculate on the fate of the missing 25 per cent, it may be pointed out that the hydroxylamine estimation used was capable of determining completely only the "fast" carbonyls and that any of the ketonic nature, as in fructose, would be but partly estimated. Another possible explanation may be that some of the carbonyls condense with conveniently located hydroxyl groups to give non-reducing cyclic products of the acetal type recovered in certain circumstances from periodate oxystarch (Grangaard, D. H., Gladding, E. K., and Purves, C. B., *Paper Trade J.*, 115:41, 1942) (Michell, J. H., and Purves, C. B., *J. Am. Chem. Soc.* 64:585, 589, 1942). In view of these uncertainties it is possible that all of the various kinds of carbonyl groups that may be present in oxycelluloses and oxystarches are not completely estimated by the present hydroxylamine method.

The authors wish to thank the following organizations for the financial assistance that made it possible to undertake the research: Technical Association of the Pulp and Paper Industry, E. I. du Pont de Nemours and Company, the Hercules Powder Company, and the Mathieson Alkali Works.

Application and Maintenance of Pumping Equipment Associated with Water Treating Equipment

A. T. NIELSEN, Application Engineer Worthington Pump and Machinery Corp.

One of the most important places where we can well spend time in insuring proper equipment application is to make sure that the manufacturer of the pumping equipment is furnished with all of the information required for him to make his selection.

In order that a clear-cut selection of hydraulic equipment may be made, the following is the minimum data required:

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PROBLEM: To find additional storage space for a large publisher and printer.

SOLUTION: 10,000 sq. ft. of floor space made 20,000 sq. ft. of storage space with a Baker Hy-Lift Truck, which paid for itself in 18 months' rental savings, and also cut car-loading time by ⅓.

B

PROBLEM: To handle large rolls of paper which must be up-ended.

SOLUTION: Baker Revolving Roll Handler* picks up rolls either horizontally or vertically — and reverses them in transit. Besides saving time, truck also conserves storage space by tiering.

C

PROBLEM: To increase production of pre-fabricated homes by faster handling of materials.

SOLUTION: Large processed wall board manufacturer uses Baker Trucks for a wide variety of handling operations, and considers them "indispensable to production".

D

PROBLEM: To cut time and cost of handling baled pulp.

SOLUTION: Baker Hy-Lift Trucks handle 16 bale skids at one time—tiering them in storage to utilize all available space. Baker Fork Trucks provide efficient loading method for rail or water carriers.

E

PROBLEM: To provide an efficient overall handling system in a large paper mill.

SOLUTION: A fleet of Baker Trucks brought about actual savings of 80% over former methods.

If you have handling problems similar to those above, a Baker Material Handling Engineer can help you find the correct solution.

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1) Type of service (describe fully).

2) Fittings required (ask manufacturer to recommend fittings for unusual liquids, see item 6).

3) Capacity (gpm at pumping temperature).

4) Total Dynamic Head (fixed or varying and what range friction and static components).

5) Suction Conditions, Static Head, Friction Head, Suction Lift or Head. Vapor pressure and all factors determining net positive suction head.

6) Liquid Pumped—Full Characteristics, Viscosity, Specific Gravity, Corrosive or Acid Nature, Size Solids, if any. Describe any unusual liquid.

7) Driver Characteristics. Shall driver be quoted. If Motor: state cycle, voltage available and type desired. If Turbine: state steam conditions, pressure, total temperature, back pressure. If Belt: Is same permissible, with which of above. (Note: If conditions of service are ever to change, belt drive often most economic drive.)

After all quotations on a particular application are received the matter of selection is at hand. It might be well to high light the decision and points that must be balanced one against the other in this the vital matter of decision.

Care must be exercised not to select equipment that does not depend upon extremely close clearances. Such units with fine fits are excellent for clear water and oil usage but should be avoided for process work as the fits cannot be depended upon to remain without wear. At this point it might be well to discuss the matter of efficiency. Most process pumps have had efficiency relegated to a secondary consideration during design in order that such points as longevity and foolproof construction might be stressed. After a unit has been applied in service (properly installed), its life expectancy is entirely one of maintenance.

The keystone of all maintenance work is good housekeeping and hand in hand with this goes maintenance routine. Frequent oiling, inspection, and repacking of pumping equipment pays dividends in locating operational faults before they have proceeded beyond the point where adjustments or "on the spot" maintenance will correct the faults.

Equipment life is in the hands of the man in whose care it rests. It is important that he thoroughly understands the construction, function, and correct adjustment of such pieces as he is delegated to husband.

Many operational difficulties are peculiar to the paper industry, and several of these will be enumerated with respect to clarifying the methods of overcoming them. One of the most prevalent of these is trouble due to centrifugal pumps not producing rated head and capacity, and yet upon examination reveal no apparent reason for the drop off. This may often be caused by a large clog of solid material, stick of wood, or similar article which lodges in the impeller and effectively reduces the diameter of the impeller eye and therefore the capacity. When the unit is shut down the liquid in the discharge line washes the obstruction out of the impeller and it disappears from view in the suction line or back to the suction source, so that when the pump is dismandled the offending material is not discovered. Quite properly therefore the suction valve on the pump should be throttled and completely closed while the pump is still running, thereby maintaining a flow through the pump right up to the last moment at which the pump may be shut down and the offending material will then be discovered and removed.

The maintenance requirement methods as applied to pumping equipment handling clear water are in general well understood and are quite completely covered by the information published by the various pumping equipment manufacturers, and consists after proper installation, periodic checkup of the various well known and well understood maintenance points. The maintenance requirements of those units handling unclear or contaminated liquids, or those containing chemicals and/or treatment materials is not quite so well understood or appreciated. These units, such as the chemical feed pump, chemical mixing pump, sludge recirculating pump, and others, require upon installation a slightly different treatment. Initially, the most important thing that can be done to prolong the useful life of these units is to supply independent clear sealing medium (generally water) to the stuffing box at a pressure somewhat above (5 to 15 pounds) suction pressure, thereby assuring a clear lubricating medium between the packing and the shaft or shaft sleeves. This point cannot be too highly stressed inasmuch as packing maintenance probably constitutes 50 per cent of the money expended on the average pump maintenance and the aforementioned method of handling can very materially increase the life of both packing and metallic stuffing box parts. All shafts or shaft sleeves in stuffing boxes should be checked for concentricity and in the event any eccentricity is found, this same should be corrected. In order that this may be properly corrected, the entire rotating element of the unit should be mounted in the lathe with the bearing fit upon which the element rotates as the centering point and the shaft or shaft sleeves trued up wherever the packing contacts it.

When reassembled, no unit, be it a clear water or a contaminated water pump, should be so run that no leakage from its box takes place. Water is an excellent lubricant when it is cold and constantly replaced; it is therefore evident that leakage should take place from the gland and no pump should be run that tight that this leakage is not in evidence. On an average anywhere from 10 to 60 drops per minute of water leakage at the gland should be evident.

All modern centrifugal pumps are equipped with drains from under the stuffing box, and for good housekeeping purposes these same should be piped to a sewer.

The matter of installation cannot be given too much consideration. Very often, especially in the case of extremely small centrifugal pumps (as chemical-feed pumps) for reasons of mistaken economy they are tucked into inaccessible places where inspection and maintenance are extremely difficult. One large chemical company has found that placing centrifugal pumping equipment in a clean, well-lighted place results in reducing the cost of maintenance of the pumps involved by 50 per cent.

Breakdowns of machinery do not "happen"—they are *caused*, and it is well within the premise of every maintenance man to investigate the causes of such breakdowns and eliminate them. The most successful manner in which this can be done is to have periodic inspection periods and to make a record of even the most trivial fact as disclosed by the inspection; each piece of equipment should have its corresponding card in the Maintenance Engineer's file and this should disclose, and be a record of life, of the particular piece of equipment. Thereon should appear the date of installation, all the manufacturer's designations, findings on periodic inspection, replacements, and any peculiarities observed during outage or operational period. Such a file becomes a life history of the equipment. If it discloses, as time goes on, that the piece of equipment or any of its component parts, are not coming up to expectation, or are failing at any unexpectedly rapid rate, an immediate investigation should be instituted to uncover the cause of such a circumstance.

In the event that equipment is to be transferred from one duty to another, it is well to consult the manufacturer in any case. Do not apply equipment to pressures, speeds, and temperatures, for which it was not designed.

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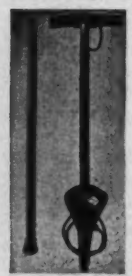

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The Effects of Various Cooking Conditions on the Bleachability and Strength Characteristics of Kraft Pulp

EDWARD H. HILL, Technical Director
North Carolina Pulp Co.

The object of this paper is to present the data accumulated from an investigation made for the purpose of determining the effects of various cooking conditions on the strength and bleachability of kraft pulps.

Four series of cooks are reported: two sets for bleached kraft pulp and two for brown kraft pulp. The cooks for bleaching purposes were made in the experimental laboratory digester, and those made for brown kraft pulp were made in the mill digester. Following is a list of the variables used in making these cooks.

Series 1. Laboratory Cooks. Varying the liquor concentration, all other factors constant.

Series 2. Laboratory Cooks. Varying the cooking time, all other factors constant.

Series 3. Mill Cooks. Varying the cooking time, all other factors constant.

Series 4. Mill Cooks. Varying the volume of liquor, all other factors constant.

The permanganate numbers were made by the standard TAPPI T 214 m-37 method. The only variable was that a clothes wringer was used to press a small disk of wet pulp to a certain consistency so that the right amount could be weighed for a one-gram sample.

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The beatings were made in a beater under the conditions specified in the TAPPI Standard T 201 m-37. The finishing and testing of the sheets were made by TAPPI Standard T 205 m-40, using the standard British sheet mold. The handsheets were conditioned at 65 per cent R. H., and 70 Fahr. for 24 hours.

The bleaching was done in glass carboys at a consistency of 3 per cent under the following conditions:

1) Chlorination Stage: Time: 60 minutes. Temperature: 77 Fahr.

2) Caustic Stage: Time: 90 minutes. Temperature: 120 Fahr.

3) Hypochlorite Stage: Time: 90 minutes. Temperature: 105 Fahr.

5) Hypochlorite Stage: Time: 60 minutes. Temperature: 110 Fahr.

6) Hypochlorite Stage: Time: 180 minutes. Temperature: 100 Fahr.

The wood used for these cooks was the regular mill wood chipped under mill conditions.

The white and black liquor used was the regular mill liquor.

Usual tests on the white liquor will run about 0.12 pound per gallon of sodium carbonate; 0.23 pound per gallon of sodium sulphide and 0.68 pound per gallon of sodium hydroxide. The liquor figures are expressed in terms of sodium oxide. The causticity usually runs around 85.0 per cent and the sulphidity about 25.0 per cent.

The chlorine and caustic used in the bleaching experiments were taken from the usual mill supply.

1) 4-hour cooks made by varying the total chemical charge from 24.0 per cent total alkali based on moisture-free wood to 32.0 per cent produced pulps with permanganate numbers ranging from 28.6 to 13.4; and yields ranging from 51.4 per cent to 47.8 per cent air-dry pulp based on moisture-free wood. The bleach consumption necessary to produce a G.E. brightness around 80.0 per cent varied from 11.5 per cent to 4.1 per cent as the concentration of the cooking liquor was increased.

2) Cooking with 30.0 per cent total alkali based on moisture-free wood produced pulps with permanganate numbers ranging from 26.0 to 14.2 and yields from 50.8 per cent to 48.0 per cent air-dry pulp based on moisture-free wood. The bleach consumption varied from 8.3 per cent to 5.8 per cent as the cooking time was increased from three to four and one-half hours.

3) Cooking in the mill digester with 30.5 per cent total alkali based on moisture-free wood and varying the cooking time from two and one-third hours to five hours, at 80 psi pressure produced pulps with permanganate numbers ranging from 30.2 to 21.9.

4) Cooking in the mill digester with 27.5 per cent total alkali based on moisture-free wood by varying the volume of cooking liquor charged on a hundred pounds of moisture-free chips from 36.0 to 20.0 gallons, produced unbleached pulps with permanganate numbers from 30.5 to 30.2. In fact the change in volume had very little effect on the permanganate numbers.

5) From the standpoint of bleached pulp, the best strength characteristics were produced from the pulps having permanganate numbers around 14 to 18, and it did not seem to matter whether the pulp was made by cooking longer or increasing the chemical charge.

6) From the standpoint of unbleached pulp the best strength characteristics were produced by cooking at 115 psi pressure, and a volume of 24 gallons per hundred pounds of moisture-free chips.

7) The bleached pulps showed higher strength characteristics than the unbleached pulps. There are two factors that may account for this: (A) The bleached pulps were made in the small laboratory digester with a circulating pump. (B) The bleached pulps were made from wood cut at a different season of the year than the wood used to make the unbleached pulps.

8) In general, it seems that the highest quality pulp was produced by cooking to a permanganate number around 30.0 with a 115 psi pressure for unbleached pulp and a permanganate number around 16.0 for a bleached pulp.

Relation of Paper to Printing on Multicolor High-Speed Presses

L. W. CLAYBOURN, Exec. Vice Pres.
J. W. Clement Co.

Paper is the foundation of printing and presents many complex problems to the printer. Too often buyers of printing do not give paper the consideration it rightfully deserves in their planning. They decide on a layout and typography, plan their art and order illustrations, and, lastly, elect to print on this or that kind of paper, price being a big factor, with little or no regard as to whether or not the paper of their selection will yield the job of their expectancy.

To correct this bad practice, let us put this in reverse. Paper, being the basic factor in any printed job, considering it from either price or quality standpoint, should be chosen first; secondly engravings, layout, art, and typography.

For the past few years our large publications have written special paper specifications to be followed, and they furnish paper to the photoengravers for proofing purposes, including their standards of inks to be used. But there is yet a vast amount of educational work to be done. The mere writing of specifications does not answer our problem.

Too few engravers are equipped to proof multicolor, where each and every plate transfers the ink to a common position on one tympan or one impression cylinder. Instead, they make proofs before the ink is set or dried, and each impression or color is transferred from their plates to a separate tympan or impression cylinder for each color. It must be understood that in proofing colors separately, whether or not the ink is allowed to dry between proofings, each color plate could be relieved or accentuated to get a result without producing a faithful proof of the etched plate. This treatment cannot be applied in multicolor

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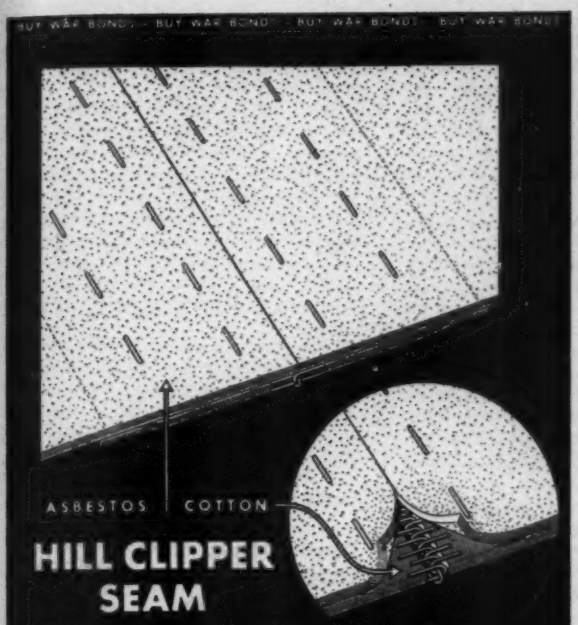

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Fig. 8051
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printing. The plate itself must be etched correctly, making it unnecessary to modify the plate as it is etched. The multicolor printer must print quantities from these same plates, attempting to get the same result using only one impression cylinder, regardless of methods used in producing the proof which he is trying to follow or match.

Multicolor methods print exactly the tone values as etched in the plates and do not lend to individual treatment of each plate. This method of printing is dependent upon strong colors that can be used sparingly and yield proper tone values, as are etched into plates, plus inks made so that they have the proper affinity for each other, trapping, superimposing to yield the many secondary colors seen in all colored illustrations.

Paper is often blamed for poor results in printing because of the use of other materials not compatible with the particular sheet of paper selected for the job.

If intelligent planning took place prior to the printing of a job, wherein all materials were tested to ascertain their fitness for the purpose intended, we would have an ideal setup.

Delicate pastel shades are often required, and the cleanness of the sheet of paper plays a part here. Special coatings are put on paper to permit semi-gloss or full-gloss printings. If the wrong sheet of paper were selected, you would never get the required result. By the same token, an ink that works beautifully on one sheet might tear the face off of another sheet of paper because of viscosity and tack.

Printing inks must be made suitable for the stock to be printed. We often proof a job on several different papers, to ascertain which paper will yield the best result. We use an ink specifically matched and made for the job, and it is hard to believe that the same ink was used on these various papers, because of the extreme difference in appearance.

One paper will yield a beautiful finish, another paper will dry out dead and dull, another sheet may show a mottled effect because of paper formation, to say nothing of being off color—all printed from the same plate and the same batch of ink. The inks may trap beautifully on one sheet of paper and not trap at all on another grade, but to look at these two sheets of paper, side by side, it would be difficult to make a choice until put to the actual printed test.

However, we must not become confused by the results obtained from this kind of test, where we use one ink for several kinds of paper, because, in all probability, an ink can be formulated to work very satisfactorily in conjunction with the paper making the poorest showing with the first ink used.

If I were a paper manufacturer, I would have formulas of printing inks developed for me to meet every requirement of the papers I manufactured, whether it be for black and white or color printing. I would show on my papers what effects various printing inks would produce. Any modern well-equipped ink manufacturer could make these inks according to these formulas, which would be a big step toward standardization.

Assuming that everything is pretested, the desirable sheet of paper is selected and reaches the pressroom to go into production, now other problems arise.

The successful operation of feeding paper at high speed depends largely upon the nature of the stock, its condition and humidification which is seldom in uniform control. The nature of the job being printed is also a factor. Some stocks and some jobs can be fed into the press much faster than others. The automatic feeder is not the determining factor of speed. Conditions of paper and the nature of the job determine this.

For best operation, stock should be trimmed squarely, piled evenly on skids, stored and covered well, to prevent absorption of moisture. When edges of stock become wavy, the sheet has expanded, which will throw a belly into it, thereby developing wrinkles. Wrinkles may be more often caused by defective stock than by the mechanism of feeder or press. Trouble often occurs in the middle of a run, after days of successful operation, caused by change in atmospheric conditions, etc.

Last and most important, we must not run the press faster than the stock can be successfully fed into it.

Some sheets of paper are limp and slow to handle; other papers are snappy, fast and full of life, and easy to feed mechanically. The mechanisms of the automatic feeder are flexible to meet these varying conditions.

It goes without saying that due consideration must be given to many operations besides printing; namely, folding, trimming, binding, etc., and I might mention durability of paper used.

The J. W. Clement Co., Buffalo, N. Y., have a laboratory fully equipped to make tests and modify materials to meet exacting requirements. Through an arrangement with C. B. Cottrell & Sons Co., Westerly, R. I., we have also installed many processes and machines that are not used in conventional printing practice. We put these machines and processes to work to determine their fitness and value in commercial printing.

I pay great tribute to C. B. Cottrell & Sons Co., with whom I am also associated, for the active part they are taking in this development in the interest of letterpress printing, and to the farsightedness of John D. Taylor, president of J. W. Clement Co., who realized the necessity of improvement for the printer of tomorrow.

Application of the Lithographic Processes to War Work

WM. H. WOOD, Director of Research
Harris Seybold Potter Co.

The present war emergency makes it possible for lithographers to contribute directly in furthering the "war effort." Beside the usual printing of government forms, Army maps, and the like, lithographic plants when properly equipped may proceed with the making of templates, loft drawings, dials, gauge sticks, panels, for tank, aircraft and ordnance production.

If the lithographic shop owner contemplates the production of templates, loft drawings, and the like, he should first investigate his facilities rather thoroughly because template making requires precision of a fairly high order of accuracy.

Cameras and platemaking equipment must be in first-class shape and lenses on process cameras should be checked for flatness of field and constancy of image size. The premises must be kept clean and dust free.

If the lithographic plant has sufficiently large and precise metal cameras it can easily produce loft panels for the airplane manufacturer. The process of preparing the loft involves copying, with a high degree of precision, drawings prepared by the aviation draftsman. High-contrast plates are required for this, because the drawings are usually in pencil and oftentimes have been severely handled before the lithographer gets them. After copying the drawings on a high-contrast plate, the drawings are projected upon large sheets of steel using a silver halide emulsion on the sheet; if high-intensity mercury arcs or high-intensity carbon arc lamps are used for projection, dichromated coatings such as deep-etch coatings may be used. Either method is satisfactory but the deep etch method gives a loft plate of greater permanence. This process involves nothing new to the lithographer beyond the coating of large size plates up to ten or twelve feet in length.

By projection it is possible to eliminate the need for large films having non-stretch characteristics.

Template production is essentially similar

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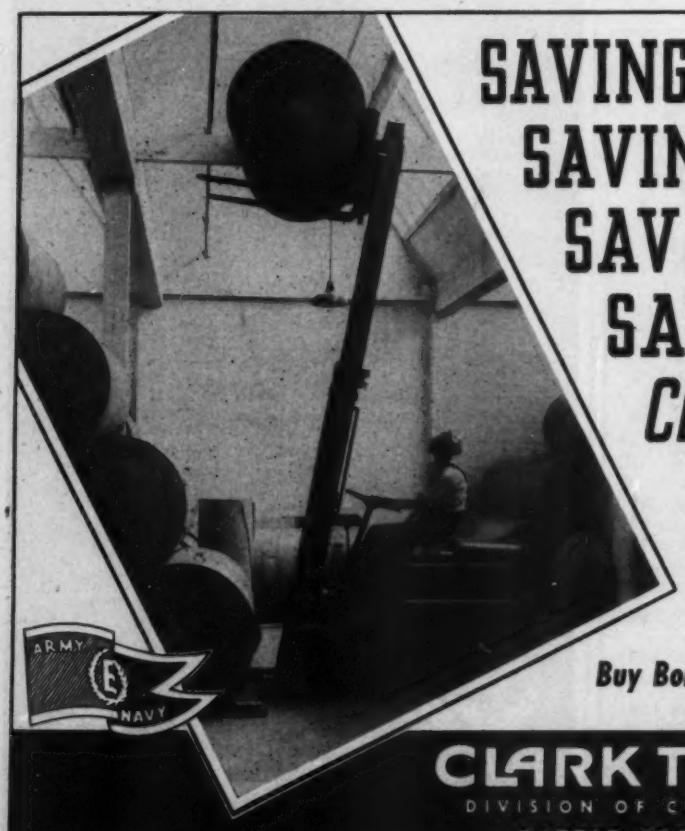
to loft production except that we operate with smaller originals and reproduce the design in smaller dimensions. The production of templates, accordingly, is not so difficult for the lithographer to master. Templates are used as guides for checking metal sheet parts, sections of ordnance pieces, and other similar designs.

The lithographer may produce template drawings by either the "surface-plate process" or the "deep-etch process." Here again the deep-etch process results in a plate of greater permanence than the surface-plate process. As a base metal for the template, zinc or galvanized steel or auto-body steel may be employed interchangeably. The surface of the sheets may be grained in the usual way as is customary in the lithographic process. A rather fine grain is best. The dichromated colloid coating, which may be albumen or one of the synthetics, is flowed over the plate in a whirler or by sponging. It is then dried and exposed under a master negative which may be a direct one to one copy of the template drawing or template original. It is best to use a high-contrast silver halide emulsion on a glass plate as a negative material. Exposure of the dried coating in a printing frame is carried out as in the regular lithograph process. A colored developing ink is used and the print is developed under water, as is customary in making a lithographic plate. The plate is then gummed up and delivered to the cutting room for cutting to exact size. If extra protection is required as would be the case with templates which required a great deal of handling in the plant, we would eliminate the gumming up process and instead apply a coating of an abrasion proof transparent lacquer which would be spread over the entire design and allowed to dry before the template was cut out. Methylmethacrylate resin lacquer is suitable for this purpose.

If we wish to make the plates by the deep-etch process, the procedure to be followed is much the same except that deep-etch materials are used throughout and a positive instead of a negative is used as a master stencil. Sulphite sheeting is satisfactory for these original positives. Deep-etch templates are considerably better than templates produced by the surface-plate process, because all of the template detail is below the surface and hence is not easily damaged through handling. Zinc and galvanized sheet steel is the best material for preparing deep-etch templates. Auto-body steel is too difficult to etch by the usual chemical etches. Sheet steel can be etched by using the deep-etch method coupled with an electrolysis process. In this method we can start with either a negative or positive master stencil.

If we start with a negative, we make a deep-etch plate in the usual way and obtain lines of hardened coating on the surface of the plate. The plate is thoroughly cleaned with alcohol to remove the deep-etch etching solution, after which the plate is dried and rolled up with a heavy resinous roll-up ink. The plate is then powdered with dragon's blood or a similar powdered resin and is lightly fused on a hot plate. The entire plate is then placed in a tank of acidulated water which removes the semi-hardened colloid coating taking the overlying ink with it. When this operation is completed, the print is dried with absorbent tissues or chamois skin and powdered again with dragon's blood which is then fused in by heating on a hot plate. This operation is repeated until a heavy resinous resist is built up leaving clear lines on the template surface. The whole plate is then immersed in an electrolytic bath which usually consists of a strong sodium chloride or ordinary salt solution to which acids or acid salts have been added. Soluble phosphates, such as sodium phosphate or ammonium phosphate, may be added to the bath and these phosphates will combine with the iron salts formed during the electrolytic-etching process to keep the bath clean and free of iron sediment. A relatively low-potential current is required for the electrolytic etching operation; from five to eight volts direct current is all that is required. Current density averages about 6 to 10 amperes per square foot of conducting plate surface. The electrolytic-etching process requires that the template be the positive plate; a lead, or stainless steel, or carbon sheet may form the cathode or negative plate. Etching proceeds rapidly but it is not possible to cut all the way through a sheet of twenty gauge auto-body steel without accessory powdering of the etched lines, because there is some line spread just as there is in chemical etching.

A serrated anode will result in some improvement in the sharpness of lines; but it is still necessary to powder the lines, if we intend to cut all the way through the plate.



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It is perhaps simpler to cut part of the way through the plate and then the template may be snapped out easily in a vise. Any lines or graduations or reading matter appearing on the template may be blocked out after the first ten minutes of etching by means of a heavy resinous solution such as heavy asphaltum. This is for the purpose of protecting such detail and preventing overetching which might be harmful.

Electrolytic etching may also be carried out by starting with a positive and preparing the plate in the same manner as an ordinary lithographic deep-etch plate—i.e., a regular image covered with developing ink is applied to the plate surface. The light-sensitive semi-hardened colloid is then removed, and the plate is placed in an electrolytic-plating bath which may contain lead salts, such as lead sulphamate. A plated coating is thereby built up on the plate. When this is of sufficient thickness the lacquer and ink are removed with a powerful solvent, and the template is placed in the salt etching bath just as before. Perhaps this method is the simpler and more practical of the two methods.

A variation of this method may be to use a negative, as in the ink and dragon's blood procedure, except that electroplating of the exposed bare metal is carried out instead of etching in the salt bath. A raised surface results and the walled inclosure thus formed can be filled with a protective resin layer such as coumarone-indene polymer. A light sanding with fine emery cloth will remove the resin from the high electroplated metal, and the lead deposit can then be dissolved away by making the plate the anode in a dilute sulphamic acid bath, after which it may be etched out in the sodium chloride-phosphate electrolytic etching solution.

The production of dials, gauge sticks, and instrument panels by the lithographic process is closely related to template production and some of the methods are identical with those used in preparing templates. The deep-etch process is preferred for dial, gauge stick, and panel production; generally zinc or aluminum sheets are employed but here again we may use galvanized steel if we wish. For preparing dials and panels having white letters or figures on a black background, we make a deep-etch plate in the usual way with a white ink in place of black ink and baking the plate after removing the semihardened deep-etch resist. The zinc surface may be blackened by using a solution of antimony chlorite in anhydrous alcohol, or a solution of copper nitrate and potassium chlorate in water. The dial is then stamped or cut out as usual. If we wish permanence greater than the ink surface provides, we may use a white lacquer in place of the usual deep-etch lacquer.

If we require black letters on a white background, then we prepare a high-etch deep-etch image, spraying white lacquer over the entire plate and removing it from the high-etched portions by using a flat abrasive sheet or by sponging away on absorbent tissues while the lacquer is still wet, the exposed zinc surface is then blackened with the alcoholic antimony chloride solution, or the copper nitrate-potassium chlorate solution, just as before. In some cases we may require that the zinc surface be left exposed in metallic form. Dial production requires on the average a lesser degree of precision than template production and it is not beyond the ability of any lithographer. Radium dials require a special production line.

There are many more miscellaneous applications of the lithographic process in war work and among these may be mentioned the making of permanent etched instruction sheets on metal plates for the benefit of shop employees, where such instructions are handled a great deal making paper-base instructions impractical. Any of the above processes may be employed for making such instruction sheets, but again we prefer the deep-etched method or the electrolytic-etching method. A suitable metal base for such instruction sheets is provided by the use of thin-gauge galvanized steel. This makes a practically indestructible base for the image which should be lacquered for greater permanence.

The printing of ultraviolet fluorescent backgrounds for field maps, aerial navigation maps and the like involves no new techniques for the skilled lithographer. A high-etch plate made by the reverse deep-etch method will make it possible to print in the fluorescent background with a water solution or a water-base ink incorporating a fluorescent dyestuff such as a selected member of the sulphoflavine series. (Sulphoflavine F.—General Dyestuff Co.) Any desired map detail is then printed in by lithography using regular lithographic inks.

NEW EQUIPMENT AND SUPPLIES

Dust Masks and Caps of Paper

Aldine Paper Co., 373-375 Fourth Ave., New York City, has announced a line of dust masks and caps made of paper. Pores of the paper permit air passage, yet pre-

vent the penetration of dust particles of ordinary size. A drawstring feature allows adjustment to all headsizes. According to the manufacturer, the caps and masks are inexpensive enough to be disposed of after use, yet they may be washed for reuse, if necessary.

Fireproof Oil-Absorbent Sweeping Compound

A floor cleaning compound, designated as *Fibre-Tex*, has been announced by Lacey-Webber Co., Kalamazoo, Mich. According to the manufacturer, the product will not burn even when the flame of a blowtorch is played upon it, nor as the result of spontaneous combustion. The manufacturer also claims that the product is highly absorbent of oils and greases, and that it has an active cleaning effect upon floors on which it is consistently applied. It is packaged in 50 lb. cartons.

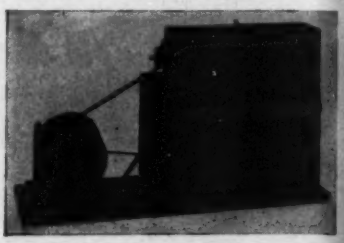
Bantam Sized Telescopic Lift Tilting Fork Truck

The Yale & Towne Mfg. Co., Philadelphia Division, Philadelphia, Pa., has announced a center control telescopic lift tilting fork truck of 2,000 lb. capacity. This truck, designated as model *KM30-2*, measures only 98 in. from 30 in. fork tip to stern. It has a single fork height lift of 71½ in. and an additional telescopic lift reaching to 129 in. The truck has four speeds forward and reverse. All controls are in easily accessible positions,

and the hoisting and tilting controls are fitted with mechanical limit safety stops. Among the other features of the truck are: adjustable forks of alloy steel; latest safety devices; alloy steel roller chains; heavy section, accurately machined, upright channels; and a tilting action for ease of loading plus added safety when loads are being transported.

Vacuum Pump

A vacuum pump for small production operations or for laboratory applications has been announced by American Typewriter Co., 614 N. Carpenter St., Chicago. Available in two standard sizes (15 cu. ft. and 7 cu. ft. displacement at 4 in. of mercury), the pump is supplied with electric motor drive (½ hp. for the larger unit, 1/6 hp. for the smaller), or without motor for use with available power source. The pump employs four bellows mounted within a square wood frame, connected to each other and to the pump outlet by a channel running through the frame. The bellows are driven by a revolving shaft through connecting straps. The shaft is V-belt driven at approximately 200 rpm.



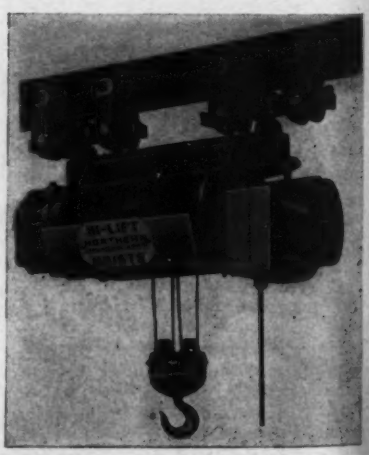
Flexible sides of the bellows are made of leather, as are intake and exhaust valves. All joints are gasketed by a sheet of Neoprene cloth. A governor permits variation of pump capacity and prevents excessive wear on parts.

Plastic Badge

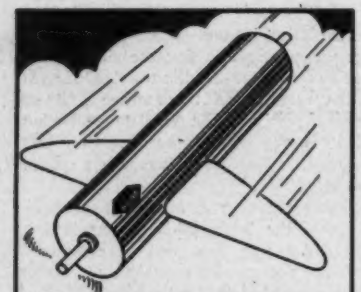
Royal Emblem Co., 41 John St., New York City, has announced an identification badge for industrial workers. Made of plastic and known as *Plasticseal*, the badge is light in weight, thin, strong, non-burning, non-magnetic, and tamper-proof. It also has no sharp edges. No tools or special equipment is necessary for its assembly.

Low Headroom Hoist for Monorail Systems

Northern Engineering Works, Detroit, Mich., has announced a low headroom hoist for operation on various types of special section monorail track systems. The hoist is mounted on trolleys designed to fit the track system in use. Made in either cab or floor controlled type, the hoist may be furnished with variable speed push button control. The mechanical load brake can be reached and friction surfaces replaced



without removing the hoist gear case cover. Other features of the hoist include: welded rolled steel plate hoist frame; heat-treated, machine cut gears; heavy duty roller bearings; splash lubrication; and split gear case.



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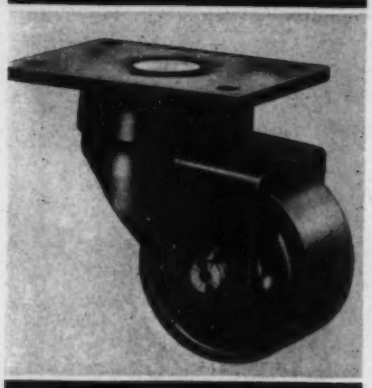

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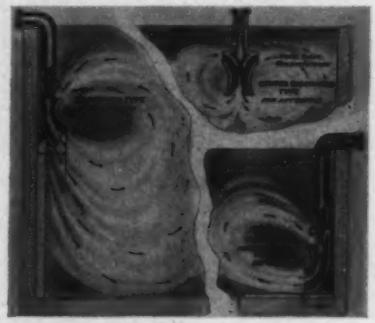
Steam Jet Agitators

The Duriron Company, Dayton, Ohio, has announced three designs of steam jets for agitating and circulating the contents of square or circular tanks. Made of high silicon iron *(Duriron)* or special stainless steel *(Durimet)*, the jets, with a maximum



projection of 4½ in., fit snugly to the inside walls of the tanks. Individually, the designs are designated as: suspended type, center discharge type, and floor type. According to the manufacturer, the jets are highly efficient for heating acid solutions, and for dissolving powdered or lump chemicals.

Protector Helmet for Factory Women

The Strauss Co., 930 Ewart Bldg., Pittsburgh, has announced a protector helmet for factory women. The helmet is molded from vulcanized fiber into a one-piece, seamless crown of great strength and

light weight. A second piece of prefo med fiber is attached to the underside of the crown to reinforce it. The helmet also is provided with an adjustable chin strap, and a hammock which rests directly upon the wearer's hair, insuring unusual comfort. It is made in black and tan colors, and in small and medium head sizes.

Hats for Women in Industry

Four attractive styles of hats for women in industry have been created for Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh, by Lilly Daché. The styles include a plastic mesh turban model; two styles of helmet—one with transparent acetate solid top and snood, the other with laced split-top and snood; and a plastic mesh cap model with high crown

and broad visor. Each style fits all heads. They are cool, lightweight, comfortable, moistureproof, and washable.

Portable Dust Collector

Ralph Maitland, Penton Building, Cleveland, O., sole agent for the Bargar Sheet Metal Co., has announced the development by his principal of a portable dust collector, known as the Bargar *"Safe-Aire."* Designed to provide a simple, flexible system for plants where dust control is needed, the device can be used either to supplement larger, permanent dust-control systems, or to serve in place of such systems when necessary.

The unit (37 in. high, 27 in. wide, and 13 in. deep and weighing less than 120

lb.) has a capacity of 600 cfm. It is powered by a ⅛-hp. motor running an Ilg blower at 3,400 rpm.

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TECHNICAL DEVELOPMENTS

These abstracts are of the latest developments found in the American and foreign press.

Pulps from Pine and Spruce Barks

This is the result of an extensive study on the chemical composition of tree barks. The authors first give a critical resumé of the rather small number of investigations on the chemistry of barks that were made by other chemists. These older studies often failed to indicate just what materials were included in the investigation, and sometimes also failed to state whether or not living as well as dead tissues were analyzed.

In the present article the term "bark" refers only to tissues already dead. In these, the isolation of the cellulose is far more difficult than in the corresponding woods, and often the usual methods fail. As an instance, the Cross and Bevan method for the isolation of cellulose by the use of chlorine could not be applied satisfactorily to pine bark. The best method involved the use of alcohol and nitric acid mixtures. One of the barks studied was that of a 90-year-old white pine. This was air-dried for a week after removal from the wood, and finally ground in a mortar and in a drum-type mill. The bark contained 12.3% alcohol-soluble extractives, 6.5% methanol-benzene soluble matter, 5.75% pentosans, 2.48% methylpentosans, and 2.74% methoxyl. The extractive-free material was treated four successive times with a mixture of 4 parts of alcohol and 1 part nitric acid, until the residue was only faintly yellow. The pulp yield obtained in this way was 21.5%, and the product contained about 70% alpha cellulose, and 6.6% pentosans. On acid hydrolysis, this pulp gave 91% reducing substances, largely glucose. Unlike Lehmann and Eisenhuth, the present authors found no galactose. Other methods of delignifying were not very successful.

The bark of a 60-year-old spruce tree was also studied. Here the "pulp" yield was also lower than in wood and (using the nitric acid alcohol method) amounted to only about 20.6%. The extractives of the bark in methanol-benzene were high, over 26%, and the bark contained about 14% tannins. In the case of this spruce bark, a special study was made of the lignin present. Depending on how the bark had been extracted, this lignin content varied widely. For example, when the bark had been extracted with methanol-benzene (without following this treatment with water) the apparent Klason lignin was over 30%. However when the extractions included (in the following order) water, alcohol, and finally benzene, the Klason lignin was only about 19%. This lignin was less methylated than in the case of spruce wood and retained only about 5.6% MeO. A rather similar result (after similar extractions) was obtained when the Willstaetter method for isolating lignin was used. If, however, the spruce bark was extracted only with ether before the Klason lignin determination was made on the bark, the apparent lignin was about 38-40%. Thus there is no very reliable method for lignin in bark. By alkaline oxidation, spruce bark gave small amounts of vanillin, but far less than that obtained from wood. This qualitative conversion to vanillin is taken as an index of the presence of true lignin in bark. A. V. Wacek and A. Schön. Holz, Roh- u Werkstoff 4, 18-26 (1941).

Paper Laminates Used in Molding

A description is given of the uses and properties of "Brunsalloys AC and ACB-3" phenolic resin-impregnated paper laminates. These can be substituted for aluminum alloys when applied to aircraft production. When very high tensile strengths are not required, a creped paper base impregnated with general purpose phenolic resin may be used. Where high tensile strength is a requisite, however, a long fibered paper base material must be used together with low-pressure, high-tensile laminating resins—i.e., Brunsalloy AC. Later a flat panel stock of very high rigidity

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was developed. This was molded with a long-fiber paper base, a low pressure laminating resin and by interlaminating birch plywood with Brunsalloy ACB-3. This same type of laminating material was found useful in the production of rather thin-walled tubes. Harold J. Luth. Modern Plastics. 20, No. 7, 138 (March 1943); through B.I.P.C. 13, 365 (May 1943).

Determination of Fermentable Sugars in Sulphite Wastes

A rapid and practical method has been devised for the quantitative determination of fermentable sugars in sulphite waste liquors. The method involves sorption analysis by means of the yeasts obtained from fermentation vats of the sulphite plant. When high concentrations of yeast are added to relatively low sugar concentrations, the sugar is sorbed by the yeast in very short order. The other reducing substances remain quantitatively unabsorbed. The difference in reducing values before and after sorption is a measure of the amount of sugar available for alcoholic fermentation. The mechanism of sugar sorption for mannose, galactose, glucose, and fructose by various yeasts was studied. The different kinds of sugar were then analyzed individually and in admixture.

Similar experiments were made with sulphite waste liquors and the results appeared to be satisfactory. The following procedure is recommended: 100 ml. of sulphite waste liquor is heated with aeration for ½ hour, replacing the water as it evaporates from the boiling solution. It is then treated with calcium carbonate so as to give a *p*H of 6.0. The mixture is cooled, the precipitate filtered and washed, and the filtrate made up to the original 100 ml. volume. Of this, ten ml. are diluted with water to 100 ml. and the total reducing sugars are determined by Schoorl's method, and calculated as glucose per 100 ml. of the original sulphite waste liquor. Fifty ml. of the diluted liquor (neutralized and filtered as above indicated) are poured into a centrifuge jar together with 2.5 to 5.0 grams of the yeast from the sulphite fermentation vats. The mixture is agitated in a thermostat at 30 C. After one hour the sample is centrifuged, and the reducing substance in the clear centrifugate again determined by Schoorl's method. The difference gives the fermentable sugar. Georg Menzinsky. Svensk Papperstidn. 45, No. 20, 421-8 (1942).

Pulping of Annual Plants

The pith and the woody stems of the tobacco and sunflower plants were subjected to analysis. The piths were free from lignin, but when cooked by the sulphite process, each yielded a swollen product which, on drying, became horny. The sunflower stem contained 34.4% cellulose (isolated by the alcohol-nitric acid method), 37.3% hemicelluloses (with 10.4% uronic acids and 24.2% pentosans), 23.6% lignin (isolated by the use of 65% sulphuric acid), and 4.7% ash. The tobacco stem showed the following on analysis: 35.1% cellulose, 39.9% hemicelluloses with 20.2% pentosans and 9.9% uronic acid, 23.2% lignin, and 1.9% ash. It appears highly probable that the uronic acids of either stem contain appreciable amounts of glucuronic acid, since only small amounts of galacturonic acid (as determined by the mucic acid method) were present. (This is a different result from that found in pith, the uronic acids of which are largely galacturonic.)

Ordinary sulphite cooks of the stems of these two plants gave good white pulps, in yields of 40-43%, which still retained 5-6% pentosans. When these pulps were hydrolyzed with 65% sulphuric acid, no lignin was left, but (what the authors term) a resistant "polysaccharide" containing 2-3% methoxyl was obtained. The lignosulphonic acids from the cooking liquors are also abnormal. They are not precipitated by the organic bases which are the usual lignin precipitants. The sunflower stems, when extracted with ethanol, yielded 7.35% extractives. A 4% solution of NaOH extracted 33.8%. In the case of tobacco stems, the respective figures were 11.35% and 33.5%. After such extractions the sunflower stems, when treated with HCl and phosphoric acid, gave 17-18% lignin, containing 17.5-18.6% methoxyl. An analogous lignin preparation from tobacco stems retained 17.1-18.5% methoxyl. The authors also give data on the Freudenberg degradation of the methylated lignins. Hans F. Müller and Wilhelm Overbeck. Berichte der Deuts. Chemgesellschaft 75, 909-920 (1942).

PAPERMAKING PATENTS

IN THE UNITED STATES — Compiled by James Atkins, Registered Patent Attorney

Inquiries should be addressed to James Atkins, Munsey Building, Washington, D. C.

Apparatus for Coating Web Material

Patent No. 2,293,691. Herman B. Harrigan, Chevy Chase, Md., assignor to District of Columbia Paper Mills, Inc., Washington, D. C., a corporation of Virginia. Original application October 25, 1939. Serial No. 301,280. Divided and this application March 27, 1940. Serial No. 326,291. 4 Claims. (Cl. 91—50). In an apparatus for applying a uniform film of fluid coating material to a web material such as paper, a bed roll, means for guiding web material to be coated over said bed roll, a support movable toward and retractable from the surface of the web material passing over said bed roll, a multiplicity of mounting members carried by said support and individually adjustable with respect to said support, a roller having a substantially smooth and non-absorbent surface journaled in one of said mounting members and adjustable in contacting relation with the surface of the web material to be coated, a feeding roller having a multiplicity of equal on the surface of said first mentioned roller for and uniform surface indentations regularly spaced and operative to measure equal minute portions of the fluid coating material journaled in another of said mounting members and adjustable in contacting relation with the substantially smooth and non-absorbent surface of said mentioned roller and operative to deposit on the surface of said first mentioned roller said minute portions of fluid coating material, the surface of said first mentioned roller being wetted by said fluid coating material, whereby the minute portions of said material tend to merge into a continuous surface film of substantially uniform thickness under the action of the surface tension of the fluid coating material application to the web material.

High-Gloss Coated Material

Patent No. 2,294,651. Wyly M. Billing, Wilmington, Del., assignor to Hercules Powder Company, Wilmington, Del., a corporation of Delaware. No Drawing. Application October 26, 1936. Serial No. 107,624. 13 Claims. (Cl. 117—155). The method for the production of a surface-coated sheet material characterized by moistureproofness, greaseproofness, high gloss, freedom from odor and taste, and nontackiness, which comprises heating to a temperature above its melting point yet below about 325° F., a synthetic resinous coating composition consisting substantially of between about 70 to about 95 parts by weight of an ethylene glycol-terpene-maleic anhydride resin and between about 5 to about 30 parts by weight of a compatible, relatively soft poly-ethylene glycol-terpene-maleic anhydride resin, applying the molten resinous composition in a thin film to a surface of a sheet and allowing the film to cool.

Method of Treating Lignocellulosic Material to Produce Moldable Products

Patent No. 2,292,390. John G. Meiler, Wausau, Wis., assignor to Marathon Paper Mills Company, Rothschild, Wis., a corporation of Wisconsin. No Drawing. Application November 19, 1941. Serial No. 419,787. 10 Claims. (Cl. 106—123). The process of treating lignocellulose material to make a product capable of being molded under heat and pressure in the presence of a plasticizer to form a product having high wet and dry strength and low water absorption which comprises digesting lignocellulose material under an elevated temperature and pressure with an alkaline aqueous solution containing a lignin-sulphonic acid compound and a predetermined amount of a readily soluble alkaline material sufficient to

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be neutralized by the acids developed during the digestion and to permit of the attainment of an acidity in the digesting material in a range extending between about pH 4.5 and 7.0 for a relatively long portion of the total digestion period and to precipitate a partially desulphonated lignin-sulphonic acid compound during the digestion, the amount of the alkaline material being such that it is completely neutralized by the acids developed during the digestion in a relatively short portion of the total digestion time, washing and drying the resultant solid product.

Pulp Treatment

Patent No. 2,294,060. John A. Wiener, Emporia, Va., assignor to Downingtown Manufacturing Co., Downingtown, Pa., a corporation of Pennsylvania. Application October 24, 1939. Serial No. 301,037. 2 Claims. (Cl. 92—23). A fibrous pulp treating apparatus including a receiver, an accepted stock chamber disposed within and spaced from the receiver, screening means disposed between the receiver and chamber, a grinder having an inlet, a conduit connecting the inlet with said receiver to convey material rejected by the screening means to the grinder, a conduit communicating with the chamber and screening means for conducting material screened by the latter to a point externally of the receiver, said grinder having an outlet and a conduit connected to the outlet and to the receiver for conveying the ground material back into the receiver for rescreening; the receiver, the two conduits connected to same and to the grinder, and the latter conjointly forming a continuous circuit for the mass to be screened until accepted by the screening means, and means for operating the grinder so as to grind and also force the material ground thereby into the second conduit and thence back into the receiver.

Wear Testing Machine

Patent No. 2,292,577. Everett A. Mahannah, Niagara Falls, N. Y., assignor to International Paper Company, New York, N. Y., a corporation of New York. Application June 14, 1940. Serial No. 340,440. 11 Claims. (Cl. 73—51). In a device for testing wear quality of paper samples, a freely rotatable support for holding a sample of paper to be tested, feed wheels engageable with the opposite faces of said sample and effective to rotate said sample and said support as the result of feeding action, means for driving at least one of said feed wheels, and means for stopping the rotation of said support at regularly timed intervals to thereby momentarily cause slip between the sample and said feed wheels.

Coated Paper and Paper Products

Patent No. 2,290,633. Paul H. Cate, New York, N. Y., assignor to Kelco Company, San Diego, Calif., a corporation of Delaware. No Drawing. Application September 18, 1940. Serial No. 357,315. 8 Claims. (Cl. 117—76). The method of treating paper for containers, wrappers, and the like, consisting in applying thereto a primary coating comprising an aqueous solution of substantially 1% water soluble alginate having a Woolwich viscosity of about 2 seconds, drying said coating, applying a second coating comprising an aqueous solution of substantially 3% water soluble alginate having a Woolwich viscosity of about 50 seconds, to render the paper resistant to waxes, oils, and organic solvents; drying said second coating; and applying thereover an outer coating of a solution taken from the group consisting of resins and waxes.

Waste Sulphite Liquor Recovery

Patent No. 2,285,876. George H. Tomlinson, Westmont, Quebec, Canada. Application January 26, 1938, Serial No. 186,938. 24 Claims. (Cl. 23—131). The method of recovering chemicals from a relatively pure magnesia base waste sulphite pulp liquor which comprises burning the combustible organic constituents of the liquor in suspension under self-sustaining combustion conditions and yet at a temperature below the fusion temperature of the non-combustible constituents of the liquor to yield a dry unsintered ash containing a high percentage of caustic magnesia, and removing substantially all of the ash produced from the combustion zone by flotation in the gaseous products of combustion in such a brief period of time that the dwell of the ash within the combustion zone is insufficient to effect dead-burning of the magnesia in the ash.

New Catalogues, Publications, and Ass'n Reports

American Manganese Steel Div., American Brake Shoe Co., Chicago Heights, Ill.—A 48-page bulletin for general industrial circulation has just been published by this company. Profusely illustrated with actual photographs, the booklet gives important facts for purchasing, engineering, and operating men in such industries as heavy chemicals, glass, sugar, paper, steam power plants, and others. How manganese steel is helping industry in general to "carry on" during wartime is the theme. Copies of the bulletin, 543-G, "Manganese Steel for General Industry," are available without cost.

American Standards Ass'n, New York, N. Y.—The new list of American Standards which will serve as a useful reference piece to the engineering and purchasing departments of manufacturing firms has just been published. More than 600 standards are listed, 94 of which represent new and revised standards approved since the last (August, 1942) issue. The 1943 list may be had by writing to the Association, 29 W. 39th St.

W. H. & L. D. Betz, Philadelphia—This company has just released a 10-page booklet reviewing the progress made during 1942 in industrial water conditioning. The information is divided into 10 subjects, and under each is a brief description and listing of the important articles written on the subject during the past year. The survey was prepared by Dr. Lewis B. Miller, a member of the Consulting Division of the company. Designated as Betz Technical Paper No. 86, it may be procured from the company, Philadelphia 24.

Brooks Equipment Corp., N. Y., N. Y.—A new book covering problems of remote controls, universal joints, shaft joints, shaft couplings, shaft hangers, shaft assemblies, engine controls, valve controls, etc., has just been released by this company. The book provides complete descriptions of 3 entirely new joints; the consolidated hinged joint with positive and effective operating range at angles from 0° to 92° in any one given plane; and the revolutionary Brooks universal joint with positive and effective operating range at angles from 0° to 360° in any plane. It is available without charge.

Elgin Softener Corp., Elgin, Ill.—An interesting treatise on boiler water conditioning, Bulletin 504, has just been issued. It explains the types of impurities found in boiler feedwater, how these impurities accumulate, what happens when subjected to boiler temperatures, the common causes of boiler scale, sludge, corrosion, and carryover, and how to prevent these troubles. A description of the Elgin deconcentrator is also included. Copies available.

Formed Steel Tube Institute, Cleveland, Ohio—The "Manual of Welded Steel Tubing for Heat Exchanger and Condenser Use" has just been released. It furnished complete information on this product to manufacturers and users of all types of heat transfer equipment. One section is devoted to an illustrated description of the welded tube manufacturing process, with special reference to the numerous tests that are used for checking and controlling the quality of all welded tubing produced for this application. Fabricating data and extensive tables of tube properties, for use in calculating surface areas, carrying capacities, displacements, etc., are also included. Copies obtainable from the Institute, 1621 Euclid Ave.

General Motors Corp., Harrison, N. J.—The Hyatt Bearings Division of General Motors has just released an Engineering Handbook—HY-Eng.-1. It is a "scrap book" collection of fundamental engineering data such as an engineer or designer might assemble himself, from various sources, to obviate the necessity of poring through numerous reference books. It also contains much entirely new material to eliminate long calculations. Requests should be made on company letterhead, giving position of one making request.

International Acetylene Ass'n, N. Y., N. Y.—A 20-page pocket-size booklet entitled, "Handbook for the Welding and Cutting Operator" has just been published. It contains a list of concise do's and don't's for the man who wields the blowpipe, and many helpful suggestions and information on the care and maintenance of blowpipes, regulators, welding and cutting accessories. Copies may be obtained from the Association, 30 E. 42nd St.

Leeds & Northrup Co., Philadelphia—A new publication, picturing the latest improvements in the electro-chemograph dropping-mercury-electrode equipment is now available from this company. The information is given under such headings as Principle, Method, Limitations, etc. Write the company, 4934 Stenton Ave., for copies of Bulletin E-94 (1).

Lignum-Vitae Products Corp., Jersey City, N. J.—A "Wartime Report on Lignum-Vitae" has just been published. The report describes many diversified applications of Lignum-Vitae in the war effort, also interesting uses before the War and potential uses in the postwar period.

National Ass'n of Manufacturers, N. Y., N. Y.—A 16-page pamphlet, "The Foreman, The Key Man in Your Plant," has just been issued as the result of an extensive study by a special subcommittee

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of the Association appointed for that purpose. A "Check-sheet" of recommended procedures in the supervisory field which it urged management to follow in order to build sound management-supervisory relations has also been prepared.

Metallizing Company of America, Chicago—This company has just published a bulletin folder describing the new Mogul Electric Bonder, a unit for preparing hardened metal surfaces for metallizing. Specifications, price, and other miscellaneous information are included.

Pusey and Jones Corp., Wilmington, Del.—This company is now making available reprints of an article entitled, "The Post-War Fourdrinier" by George H. Spencer, which appeared in the December 26, 1942, issue of *Paper Mill News*. The article is condensed from the paper with 30 illustrations that he presented at Atlanta, Georgia, during the Joint Meeting of the Southern and Southeastern Divisions of the American Pulp and Paper Mill Superintendents Association.

Roots-Connersville Blower Corp., Connersville, Ind.—Bulletin 31-B-15, covering Victor-Acme positive displacement gas pumps, has just been issued by this company. A 6-page folder in 2 colors, it contains many illustrations showing various types of driving arrangements. Construction of the units, together with sectional views emphasizing the various features are included, and a diagram shows volume and power characteristics at constant and variable speeds. Copies are available upon request.

Books

The Chemistry of Natural Coloring Matters—This volume represents an attempt to survey in the English language the chemical relations known to exist among natural compounds which possess visible color. The text, originally written by Dr. Fritz Mayer, formerly Professor of Chemistry in the University of Frankfort-on-Main, was translated and revised by Dr. A. H. Cook, Department of Chemistry, Imperial College of Science, London. The revision includes findings up to the summer of 1941.

Arranged in five chapters, the subjects covered by the chapter headings are as follows: Cartenoids (Polyene Pigments), Diaroylmethane Compounds, Carbocyclic Compounds, Heterocyclic Compounds, and Compounds Containing Heterocyclic Nitrogen Atoms. A general bibliography, an author index, and a subject index complete the volume. Containing more than 350 pages of material, bound attractively in blue cloth cover with backbone printing in gold, the book, designated as ACS Monograph Series No. 89, is priced at $10 a copy by the publisher, Reinhold Publishing Corp., 330 W. 42nd St., New York.

Continuous Process and its Contribution to Textile Progress—A limited edition of this deluxe volume has just been released by the Industrial Rayon Corporation, New York City. It is an authentic, illustrated chronicle of the major technological advances which have made textile history. The very comprehensive story of textile progress closes with a two-page flow chart of the Industrial Rayon Company's continuous process.

The book is printed in offset on book paper, and the illustrations, which are from old lithograph drawings, are reproduced with duotone borders. The artistry of this volume is enhanced by the board cover which is bound in color, with special rayon serge, and the title is woven with two colors into a special white rayon label. Only a few copies were available for distribution, but the book may be seen at public libraries, industrial museums, universities, and colleges, and textile schools in major textile and industrial centers. Anyone wishing copies of the illustrations may obtain prints of same from Hill and Knowlton, Guildhall Building, Cleveland.

Commercial Timbers of the United States—Published formerly under the title Indentification of the Commercial Timbers of the United States, this book, by the same authors, not only includes information on the identification of domestic timbers but also treats of structure, properties, and uses of these woods. The authors are: H. P. Brown, Professor of Wood Technology, New York State College of Forestry; and A. J. Panshin, Assistant Professor of Forestry, Michigan State College. The first nine chapters of the book are devoted to a consideration of the gross features as well as the minute structure of wood. These chapters are followed by an extensive presentation of miscellaneous information on wood, two keys for the identification of the more important commercial woods of the United States—one based on features discernible with the naked eye and hand lens, the other based on minute features; a section covering descriptions of 75 different species of wood; and a glossary. The book has a page size of 6 in. by 9 in.; contains 554 pages; has 311 illustrations; and is priced at $5 a copy. The publisher is McGraw-Hill Book Co., Inc., 330 W. 42nd Street, New York.

Industrial Fire Brigades Training Manual—Published by the National Fire Protection Association, 60 Batterymarch St., Boston, Mass., this 184 page volume is designed primarily as a training manual for employees assigned to carry out fire fighting duties under direction of the chief of the private brigade. The book, profusely illustrated, is divided into 16 chapters; namely, The Industrial Fire Brigade, Forcible Entry Practices, Rope Work, Fire Extinguisher Practices, Ladder Practices, Hose Practices, Salvage and Overhaul Practices, Fire Streams, Ventilation Practices, Periodic Inspections of Plant Fire Protection Equipment, Care of Fire Brigade Equipment, Fire Causes and Fire Hazards, Fire Fighting Procedure, Flammable Liquid and Gas

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Fires and Special Extinguishing Systems, Electrical Fires, and Gas Masks and Rescue Practices. Bound in paper cover and with a page size of 8½ x 11 inches, the book is priced at $1.50 a copy by the publisher.

A Laboratory Handbook of Pulp and Paper Manufacture—Dr. Julius Grant, Chief Chemist, John Dickinson & Co., Ltd. (England), is author of this book which incorporates the fourth edition of Stevens' *Paper Mill Chemist*. The book, however, is concerned principally with laboratory and control methods and virtually is a new work from cover to cover. It is a volume of nine chapters; namely, The Scope and Function of a Mill Laboratory, Fibrous Raw Materials and the Preparation of Half-Stuffs, Non-Fibrous Raw Materials Used in the Preparation of Half-Stuffs—The Recovery Process-Bleaching, Half-Stuffs and Their Evaluation, The Beater House, The Machine House and "After"-Processes, Paper Testing—Physical Methods, Paper Testing—Chemical and Microscopical Methods, and Paper Testing—Special Methods, Statistical Analysis, Water, Fuel. Each chapter is concluded with an extensive bibliography. The book includes an author index as well as a subject index. Totaling more than 300 pages and bound in cloth cover, the book is priced at $10 a copy by Longmans, Green and Co., Inc., 55 Fifth Ave., New York City, and Edward Arnold & Co., London, England, the publisher.

Plastics from Farm and Forest—This pocket-sized, cloth-covered book, by E. F. Lougee, former editor of *Modern Plastics*, presents the story of plastics in the language of the layman. Not at all technical in character the story opens with a chapter entitled Plastics Today. The subjects of the other chapters in the order of appearance are: Plastics Began with Cotton and Wood; Lignin from Wood Waste; Hulls, Shells and Cobs; Other Farm Wastes; Soybeans . . . An Industrial Crop; Buttons and Cloth from Skim Milk; Plastics from Coal, Oil, Water and Air; The Rubber Question; and What Next. Interestingly illustrated, this small volume is priced at $2 a copy by Plastics Industries Technical Institute, 186 S. Alvarado St., Los Angeles, Cal.

Potash in North America—This book, by J. W. Turrentine, Ph. D., published as No. 91 of the Monograph Series of the American Chemical Society, is a work of nearly 200 pages. Bound in blue cloth cover with backbone printing in gold, the volume reviews what has happened in the potash industry since 1926; discusses the uses of potash in American industries; and takes up the technology of potash production. Published by Reinhold Publishing Corporation, 330 West Forty-Second St., New York City, the book is priced at $3.50 a copy.

Practical Emulsions—This volume is designated on the title page as a handbook of emulsions, emulsifiers, and methods of formulating and making emulsions of practical value in industry. Written by H. Bennett, Technical Director, Glyco Products Company, Inc., the book is divided broadly into two parts. Part I takes up such subjects as emulsifying agents; types of emulsions and foams; methods, formulation, equipment; stability; general technical emulsions; dispersing agents, and wetting agents; and also presents a list of emulsifying agents, a list of emulsions, and a list of demulsifying and defoaming agents. Part II of the book is given over to formulas—making up a little over half of the 452 pages of the volume. There are formulas on paper processing emulsions, resin and rubber emulsions, waterproofing emulsions, wax emulsions, lubricant emulsions, defoaming agents, etc. The price of the book is $5 a copy; the publisher, The Chemical Publishing Co., Inc., 26 Court Street, Brooklyn, N. Y.

Association Reports

All of the orders which affect the industry emanate from the OPA and WPB and clear through the office of E. W. Tinker, executive secretary of the American Paper and Pulp Association. Copies of all government orders are sent by the Association to members. Listed below are releases sent out during May by the APPA. Any correspondence with that office regarding these releases should carry identifying titles and numbers under "Federal Regulations."

Materials and Supplies No. 15—L-11 Chlorine (Amended).

Materials and Supplies No. 16—Regulations Applicable to the Controlled Materials Plan, Regarding Paragraph 3175.5 of CMP Regulation No. 5.

Materials and Supplies No. 17—Fibrous Raw Material Situation.

Materials and Supplies No. 18—CMP 5—Revised—Maintenance, repair and operating supplies.

Paper Production No. 13—M-241 (Amended)—The general meaning of the order is not changed by the amendment of May 15, but in its present form it is clarified and the references to WPB 514 are brought more closely into line.

Paper Production No. 14—L-244 (Amended)—Printing and publishing.

Prices No. 4—MPR 30, Amendment 2—Wastepaper.

Labor—War Manpower Commission No. 15—Essential Papers. Activity and Occupation Bulletin No. 27 which declares essential, Pulp (made from pulpwood and other substances) as well as 28 types of paper stock and paperboard.

Labor—War Manpower Commission No. 17—Replacement Schedules. Information regarding Manning Tables and Replacement Schedules is important to every paper and pulp manufacturer.

Pulpwood Production No. 5—Price Ceilings—Pulpwood in the Southeast.

Wood Pulp Production No. 3—Information on the Wood Pulp Situation.

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Prompt shipment of maintenance parts and supplies.

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SPRINGFIELD, OHIO

CURRENT MARKET QUOTATIONS

RAGS (Domestic)

NEW RAGS — *per cwt.*

OPA ceiling prices in sales to consuming mills delivered buyer's usual receiving point, with brokers' allowance not in excess of 5 per cent.

Blue Overalls	-5.50
Corduroy, Men's	-3.50
Corduroy, Ladies'	-3.00
Washables, No. 1	-3.00
Percales	-4.75
New Soft Blacks	-3.75
Light Prints, No. 1	-4.50
Khaki Cuttings—	
Bleachable	-4.25
Unbleachable	-3.50
New White Canvas	-6.50
New Mixed Blacks	-3.25
Canton Flannels, Bleached	-7.00
Shirt Cuttings—	
New White No. 1	-7.25
No. 1 White Heddings	-7.25
White Shrunk	-5.00
Silesias No. 1	-5.75
New Unbleached	-7.50
Fancy	-3.50
Linen Cuttings—	
American	-5.00
White	-14.00
Gray	-14.00

RAGS (Domestic)

f. o. b. New York City

OLD RAGS

OPA ceiling prices in sales to consuming mills f. o. b. cars at points of shipment, with brokers' allowances of $1 to $2 a ton depending on the value of the grade involved.

Roofing—	*per ton*
No. 1	31.00
No. 2	29.00
No. 3 and No. 4	27.00
Twos and Blues—	
Repacked	44.00
Thirds and Blues—	
Repacked	44.00
Miscellaneous	36.00
Whites, No. 1—	
Repacked	76.00
Miscellaneous	64.00
Whites, No. 2—	
Repacked	58.00
Miscellaneous	53.00

RAGS (Foreign)

ex dock New York City

NEW RAGS — *per cwt.*

Nominal:
- New Dark Cuttings
- New Mixed Cuttings
- New Light Silesias
- Light Flannelettes
- Unbleached Cuttings
- New White Cuttings
- New Light Oxfords
- New Light Prints

RAGS (Foreign)

ex dock New York City

OLD RAGS — *per cwt.*

Nominal:
- No. 1 White Linens
- No. 2 White Linens
- No. 3 White Linens
- No. 4 White Linens
- No. 1 White Cottons
- No. 2 White Cottons
- No. 3 White Cottons
- No. 4 White Cottons
- Extra Light Prints
- Ord. Light Prints
- Med. Light Prints
- Dutch Blue Cottons
- French Blue Cottons
- French Blue Linens
- Checks and Blues
- Linsey Garments
- Dark Cottons
- Old Shoppers

ROPE and BAGGING

f. o. b. and ex dock New York City

Gunny No. 1—	*per cwt.*
Foreign	Nominal
Domestic	4.50 to 4.75
Wool Tares—	*per cwt.*
Light	4.00 to 4.25
Heavy	4.25 to 4.50
No. 1 Scrap Bagging	3.75 to 4.00
Manila Rope—	
No. 1 large	-*115.00
No. 1 small	-*105.00
Sisal Rope—	
No. 1 large	-*95.00
No. 1 small	-*85.00
New Burlap Cuttings	5.75 to 6.25
Jute Threads—	
Foreign (Nom.)	6.25 to 6.75
Domestic	5.50 to 6.00
Strings—	
No. 1 sisal	-*80.00
No. 2 sisal	-*60.00
Soft Jute	5.00 to 5.25
Mixed	1.25 to 1.50

*OPA ceiling price per ton f. o. b. shipping point.

WASTE PAPER

OPA ceiling prices f. o. b. points of shipment, with brokers' allowance of 4 to 9 per cent.

Shavings—	*per ton*
White Env. Cuts, One-Cut	67.50-
Hard White Env. Cuts	62.50-
Hard White, Unruled	57.50-
Soft White, One-Cut	57.50-
Soft White, Misc.	42.00-
Fly Leaf, No. 1	32.50-
Fly Leaf, Woody, No. 1	25.00-
No. 2 Mixed Col. Woody	18.00-
Flat Stock—	
No. 1 Heavy Magazines	33.50-
Mixed Books	17.00-
Ledger Stock—	
No. 1 White	43.00-
No. 1 Mixed (Colored)	37.50-
Manilas—	
New Env. Cuttings	53.00-
New Env. Cuts, One-Cut	57.50-
Extra Manilas	37.00-
Manila Tab Cards, Free of Ground Wood	45.00-
Ground Wood Manila Tab Cards	37.00-
Kraft—	
Envelope Cuttings	65.00-
Mixed Env. or Bag Cuts	55.00-
Tripled Sorted No. 1 Brown	50.00-
New 100% Cor. Cuts	45.00-
No. 1 Old Assorted	35.00-
News—	
White Blank	33.00-
Overissue	17.00-
No. 1 Baled	15.00-
Old 100% Kraft Corrugated Containers	35.00
Old Corrugated Containers	23.00
New Corrugated Cuts	18.00-
Mill Wrappers	17.00-
Box Board Chips	14.50-
No. 1 Mixed Paper	14.00-

CHEMICALS

f. o. b. shipping point

Alum (Papermakers)—	
Lump, cwt.	4.25-
Ground, cwt.	4.00-
Powdered, cwt.	4.40-
Blanc Fixe—	
Pulp, bulk, ton	40.00 to 46.50
Dry, barrels, pound	00.00 to -
Bleaching Powder—	
Drums, cwt.	2.25 to 3.10
Casein (Domestic Standard)—	
20-30 mesh (bags), lb.	21.00 to 21.75
80-100 mesh (bags), lb.	—
Argentine, lb.	—
China Clay—	
Domestic Filler Bulk (mine) ton	7.50 to 15.00
Domestic Coating Bulk (mine) ton	12.00 to 22.00
Imported (ship side) Bulk (lump) ton	15.00 to 26.00
Chlorine—	
Tank cars (wks) cwt.	2.00 to 2.25
Gelatine (silicin), lb.	.90 to .95
Glyc. (C.P.) drums, lb.	18.25 to 18.75
Litharge, powd., bbl., lb.	.09 to -
Rosin (Gum)—	
New York, per 100 lbs.	
E	3.80-
F	4.80-
G	4.11-
WW	5.26-
Rosin (Wood), carlots	3.25-
Salt Cake—	
Dom. bulk (wks) ton	15.00 to 16.00
Imp. bulks on dock— (Atl. ports) ton (Nom.)	20.00 to
Soda Ash—	
Bulk (works), cwt.	.90 to .95
Paper Bags, cwt.	1.05 to 1.35
Barrels, cwt.	1.05 to 1.35
Soda (Caustic)—	
Solid, drums, cwt.	2.30 -
Ground and flake, drums, cwt.	2.70 -
Sodium Silicate—	
60 deg., 55 gal. drums, (works) cwt.	1.65 to 2.05
40 deg., 35 gal. drums, (works) cwt.	.80 to 1.45
Starch—	
Pearl, 140 lb. bags, cwt.	3.10-
Pearl, barrels, cwt.	3.20-
Paper (Sp.) bags, cwt.	3.20-
barrels, cwt.	3.30-
Sulphur (crude)—	
(mine) bulk, long ton	16.00 to 20.50
Talc—	
Dom. 100 lb. bags (mine) ton	16.00 to 21.00
Imp. bulk, ton (Nom.)	—
Titanium Dioxide—	
Barium Pig., bbls., lb.	.05¾ to .06
Calcium Pig., bbls., lb.	.05 to .05¼
Zinc Sulphide, bbls., lb.	.08¼ to .08½

WOOD PULP

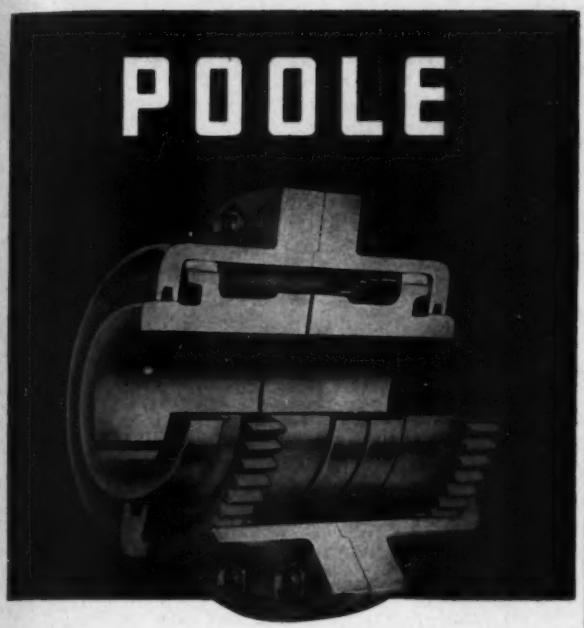
OPA maximum prices applicable to wood pulp delivered to consumer mills located East of the Continental Divide exclusive of Denver, Colo.:

Bleached softwood sulphite	76.00
Unbleached softwood sulphite	66.00
Bleached hardwood sulphite	73.50
Unbleached hardwood sulphite	63.50
Bleached Mitscherlich sulphite	81.00
Unbleached Mitscherlich sulphite	72.00
Northern bleached sulphate	86.00
Southern bleached sulphate	79.00
Northern semi-bleached sulphate	82.00
Southern semi-bleached sulphate	75.00
Standard news print siderurus	46.00
Northern unbleached sulphate	73.00
Southern unbleached sulphate	63.50
Bleached soda pulp	66.00
Unbleached soda pulp	62.00
Ground wood pulp	46.00
Sulphite screenings	38.50
Sulphate screenings	38.00
Ground wood screenings	30.00
Northern unbleached sulphate siderurus	73.00
Southern unbleached sulphate siderurus	63.50

PAPER

f. o. b. New York City

Boards—	*per ton*
Binders	84.00-
Chip	45.00-
Chip, agt. mls. lined	60.00-
Coated, white patent .016	80.00-
.020 and heavier	75.00-
Kraft liner	63.00-
News	48.00-
Sock (cased)	*per cwt.*
No. 1 Coated	15.50-
No. 2 Coated	14.00-
No. 3 Coated	13.25-
No. 4 Coated	12.75-
No. 2 Offset	11.00-
A Grade Super	10.75-
B Grade Super	10.25-
Bonds (Rag Content)—	
100% Rag	*per cwt.*
Ext. No. 1	42.50 to 46.00
100% Rag	35.00 to 37.75
85% Rag	
75% Rag	25.00 to 27.00
65% Rag	
50% Rag	20.50 to 22.75
25% Rag	18.20 to 20.00
Regular Colors	1.00 cwt. extra
Bonds (Sulphite)—	*per cwt.*
No. 1	11.70-
No. 2	10.75-
No. 4	9.90-
Colors	1.00 cwt. extra
Glassine (f. o. b. mill)—	*per cwt.*
Embossed (25 lb. up)	13.75 to 14.25
Bleached (25 lb. up)	12.75 to 13.25
Unbleach. (25 lb. up)	11.50 to 12.00
Greaseproof—	
Bleach. (25 lb. up)	11.00 to 11.50
Unbleach. (25 lb. up)	10.00 to 10.50
Ledgers (Rag Content)—	
100% Rag	*per cwt.*
Ext. No. 1	41.40 to 48.50
100% Rag	36.25 to 39.25
85% Rag	32.20 to 37.75
75% Rag	26.25 to 28.00
65% Rag	22.80 to 27.75
50% Rag	22.10 to 24.25
25% Rag	19.50 to 21.50
Regular Colors	1.00 cwt. extra
Ledgers (Sulphite)—	*per cwt.*
No. 1	13.00-
No. 2	12.05-
No. 4	11.30-
News—	*per ton*
Rolls (Contract)	54.00-
Rolls (Spot)	(nominal)
Sheets	62.00-
Tissues (Carlots)—	*per ream*
White, No. 1	1.12½ to 1.20
White, No. 2	1.00-
Bleached Anti-Tarnish	1.15-
Colored	—
Anti-Tarnish Kraft	.70-
Manila	.90 to .95
Napkins, semi-crepe (12½ lb. to M shts.) per cs.	.80-
Napkins, full crepe and emb'sed (12½ lb. to M shts.) per cs.	.60-
Toilet, Bleached (M shts.) per cs.	5.65-
Toilet, Unbleached (M shts.) per cs.	4.25-
Towels—	*per case*
Bleached	3.20 to 3.75
Unbleached	2.60 to 3.05
Wrappings (Kraft)—	*per cwt.*
Extra Quality	6.00-
Super-Standard	5.25-
No. 1 Wrapping	5.00-
Standard Wrapping	4.75-
Standard Bag	4.37½-
Wrappings (Sulphite and Bleached Kraft)— (Rolls, f. o. b. mill)	
Bleached papers—	
M.F. & M.G. Waxing, 20 lb. (Carlocds only)	*per cwt.* 7.25 to 7.50
(10,000 lbs.)	7.50 to 7.75
Drug wrapp. 35 lb.	7.00 to 7.25
Unbleached Papers—	
Com. Grd. Butch. 40 lb.	5.50 to 5.75
No. 1 Butchers	5.75 to 6.00
No. 1 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	6.25 to 6.50
No. 2 Imit. Parch & Dry Fin. Groc. Sulphite 30 lb.	6.00 to 6.25
Steam Finish, 50 lb.	5.00 to 5.25
Water Finish, 40 lb.	5.50 to 5.75
Manilas—	
Envp. Mls., Sub. 16-40 (No. 1)	6.00 to 6.25
Envp. Mls., Sub. 16-28 (No. 2)	5.75 to 6.00
Envp. Mls. (Prices based on large sheets untrim'd reammarked, in bdls.)	
Wrapp. Mls. 35 lb. up—	
No. 1	6.00 to 6.25
No. 2	5.75 to 6.00
M. G. Sulphite and Kraft (other than Waxing)	
Grade A-22 lb.	7.20 to 7.40
Grade B-20 lb.	6.75 to 7.00



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WANTED—Dryers complete with frames, gears, bearings, packing boxes and syphon heads. Also drive suitable for driving from line shaft in basement. Dryer sizes as follows: 5 or more of each—48" dia. x 90" face, 48" dia. x 110" face, 48" dia. x 130" face.

Also wanted—Hydrapulper suitable for handling 100 tons of mixed papers per 24 hours.

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WANTED—Manufacturers Representative. Man now covering paper mills in Ohio, Illinois and Michigan, to take on paper makers felt line. Please reply in full detail. Address Box 334, Fritz Publications, Inc.

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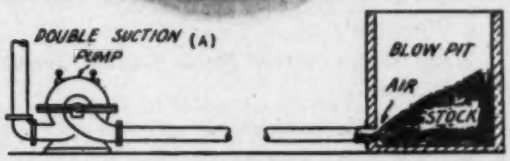
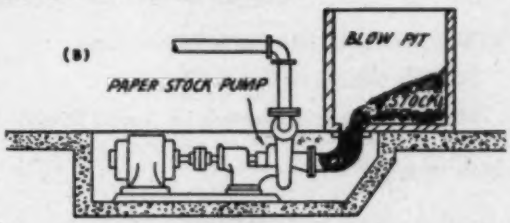
GOULDS PUMPS

SOLVE A PAPER STOCK PUMPING PROBLEM

...original installation shows a double ... pump on blow pit service incorporating a long horizontal run of suction pipe, with the pump located 30 ft. from the chest.



The outlet from the chest and pump were approximately at the same level, leaving little or no submergence when the stock level was low in the chest. When the pumping operation reached this point, air was drawn into the suction pipe and, collecting in the top of the suction pipe and pump casing, effectively air bound the pump. When this condition occurred, it was necessary to direct a large stream of water into the chest and raise its level to again permit the pump to operate.



This shows the method by which the trouble was corrected. A regular side suction type of paper stock pump was used, located in a pit below the bottom of the chest with a short and direct suction elbow from chest to pump. This paper stock pump was of the top horizontal discharge type and when this change was made the pump performed entirely satisfactorily and would pump the chest clear down to the bottom. Any air entering the suction pipe at low chest levels was easily discharged from the pump through the self-venting top horizontal discharge nozzle.

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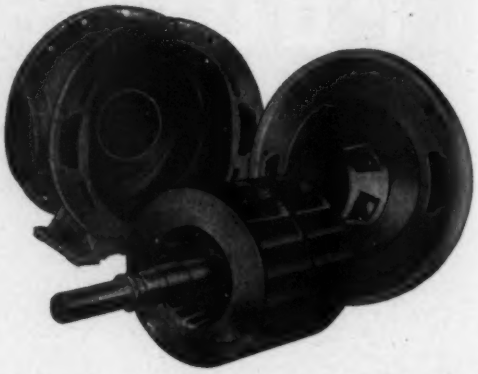

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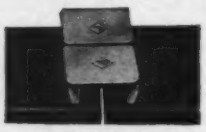

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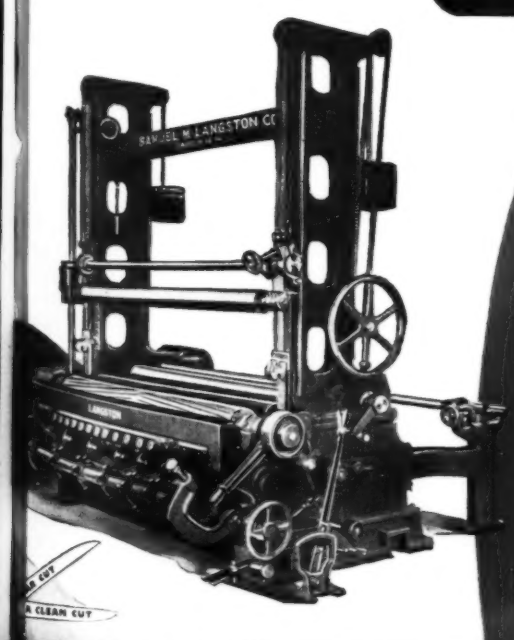

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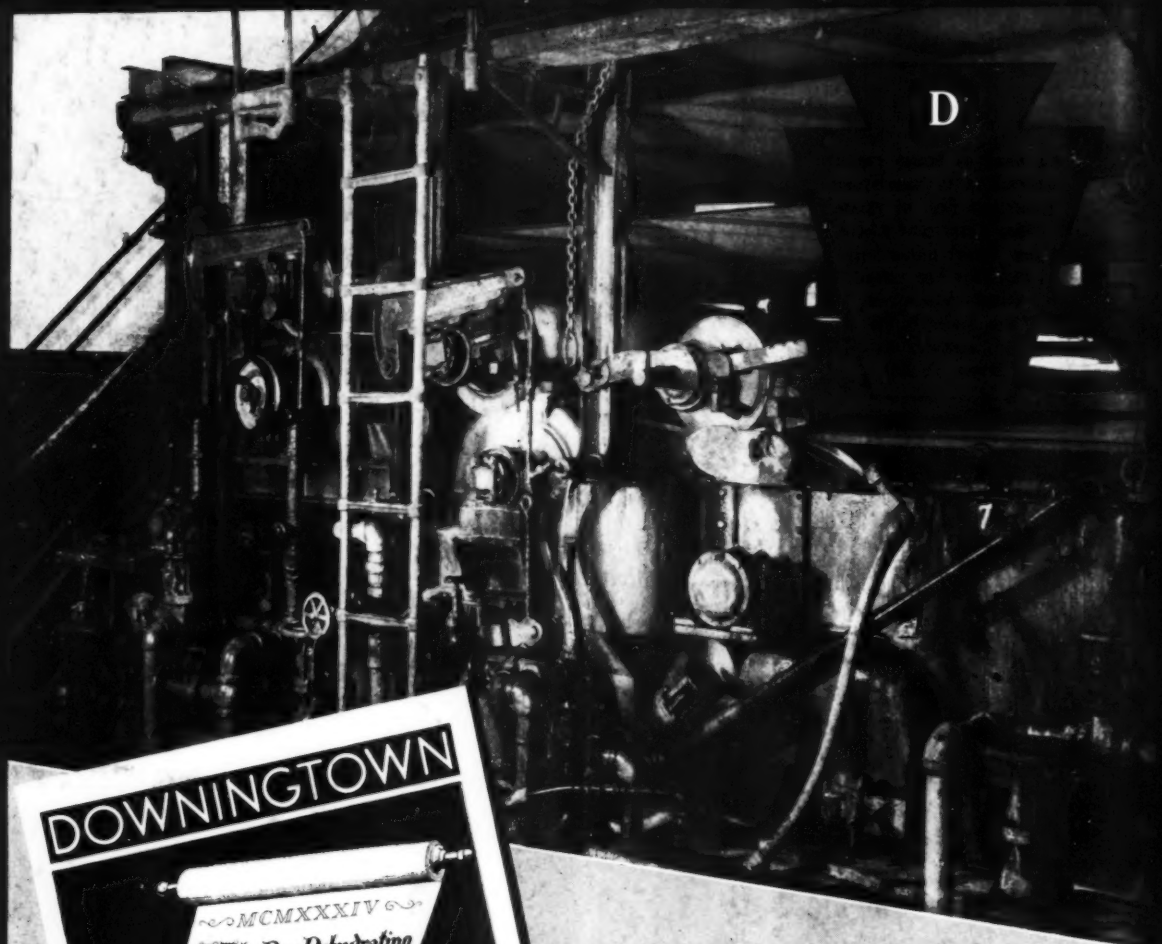

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